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AVIATION

The Oldest American Aeronautical Magazine

3 INTERNATIONAL RECORDS *with* PRATT & WHITNEY ENGINES

Three international records in three days! These are among the brilliant achievements of Pratt & Whitney-powered Army airplanes during the Air Corps' celebration of its 30th Anniversary. The giant Boeing B-15 establishes a new world's load-carrying record and also sets a new long distance closed course speed record, while a Grumman OA-9 races to a new amphibion speed mark. All three of these new records were made with standard service equipment—including dependable Pratt & Whitney engines.

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Picked Up Along Editorial Airways

» BREAK FOR RESEARCH came when Congress passed the Third Deficiency Bill which contained an immediate appropriation of $1.8 million cash, plus contract authorization up to $10 million. At this point we can do nothing less than stand up and cheer. It seemed scarcely conceivable that the country's needs for an expanded research program to support our air arm expansion plans should have been questioned at all. Those of us who have seen for ourselves something of the outstanding laboratories abroad, particularly in Germany, have long since realized how badly we have dropped behind in aeronautical research. But Colonel Lindbergh, Dr. Lewis, and a handful of others have been carrying on a long up-hill battle against sectional jealousies and political finageling and downright ignorance to obtain essential funds. Until practically the last minute it was touch-and-go as to just what the decision would be. There is a great deal of satisfaction now in knowing that once again we may be in a position to regain that lead in aeronautical research that was ours for so many years, but which has been lost to those nations of Europe who have put their aviation under extreme pressure for military reasons. We need it today to meet the military threat that is abroad in the world. We will need it tomorrow to support the vast development of commercial aviation that is just over the horizon.

"McGuire is getting set to make a bid for the Thompson Trophy."

» ONE HUNDRED FIFTY MILLION DOLLARS is important money in anybody's poker game. It should buy a lot of blue chips. In any case it is America's 1939 ante in the great game of world air power development. Never before in history has any such amount been available to the aircraft industry and it should certainly provide our industry with the impetus that it has long needed to launch aviation in America into the realm of big business. Possibly it is unfortunate that this move should be founded on war-like preparations. Too bad that such sums cannot yet be made available for commercial development. But just as 1916–1918 gave aviation its initial push, so the events of 1939–1941 may so speed development to launch a great commercial aviation boom for the 1940s.

In Germany in 1936 we noticed signs in various aircraft factories to the effect that "For your jobs you may thank the Fuehrer." An amusing sequel was the appearance of similar signs in several of the large British aircraft factories the following year. It is not impossible that the man who sits in AVIATION's editorial chair ten years hence will look over the great

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AERONAUTICAL PRODUCTS
30 ROCKEFELLER PLAZA
NEW YORK, N. Y.
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accomplishments of 1950 (with trans-Atlantic departures every-hour-on-the-hour, with thousands of airplanes transporting people and goods on peaceful missions from one end of the country to the other, with hundreds of thousands of privately owned planes in use for business and pleasure) and he, too, may be able to say, "For all this we may thank the Fuehrer." For the airplane, although one of the most powerful weapons for war ever forged, has its greatest potential as an instrument of peace. Today we spend our millions for wings of commerce,—hundreds of millions for wings of war. Our greatest hope for the future is to see this ratio reversed. It all depends on whether general sanity can be restored in the world before we succeed in destroying ourselves.

» **WAR OR PEACE,** whatever lies ahead for aviation, it is certain that we are in for a period of rapid expansion of plant and personnel in the next two or three years. T. P. Wright, in his article in June AVIATION, "America's Answer," plotted the trends of labor requirements for the period ahead. And as certain as death and taxes, anyone who has anything to do with the hiring, firing, or training of labor in connection with this program will run up against one of the important (and not always well understood) laws of the land, known as the Wagner Act. Sooner or later he will have to deal also with its administering body, The National Labor Relations Board. The meaning of the Act and the interpretation of the N.L.R.B. have caused frequent headaches to management and labor alike. Everyone who has anything to do with this problem, especially in the critical period of high pressure aircraft production which we are facing, would do well to add to his library and study carefully a little book recently published, entitled "The Worker, the Foreman, and the Wagner Act." It is by Russell Greenman (a consultant in labor relations) and is published by Harper Brothers in New York. It gives in non-legal, everyday English, the essence of the Wagner Act and cites many cases of N.L.R.B. interpretations from actual cases which have been adjudicated. It's the best thing we have seen on the subject so far.

» **RAIN OR SHINE,** as Labor Day weekend dawns, the thundering herds will be at it again, streaking across Cleveland's skies, diving at pylons, risking necks to give Clevelanders and guests a show for their money,—hopeful, too, of annexing a bit of the prize money to rejuvenate bank rolls depleted by the winter's revamping of last year's race designs. But that anything of lasting importance will come of it we must voice our annual doubt. We have been more than skeptical of the "laboratory of the industry" argument for lo, these many years. The uncontrolled, hit-or-miss brand of research conducted by the independent race plane builder contrasts sadly with that type of research that we mentioned earlier in these columns, and has seldom turned up anything new or of practical value to the commercial or military designer. Much as we admire the ingenuity and personal valor of the pilot-designers who turn up to race year after year, we cannot help but feel that their talents might be expended more profitably in bona-fide industry research programs where they could be given opportunity to prove their theories without a great and unnecessary risk to their necks. In the period of expansion and development that lies immediately ahead we will have to conserve and utilize to its fullest extent every ounce of available brain power, and it would be too bad to see any of it wasted unnecessarily. We are hopeful that the 1939 races can be run off without accident, and that the crowds can be given a sensible program that will boost, and not hinder aviation.

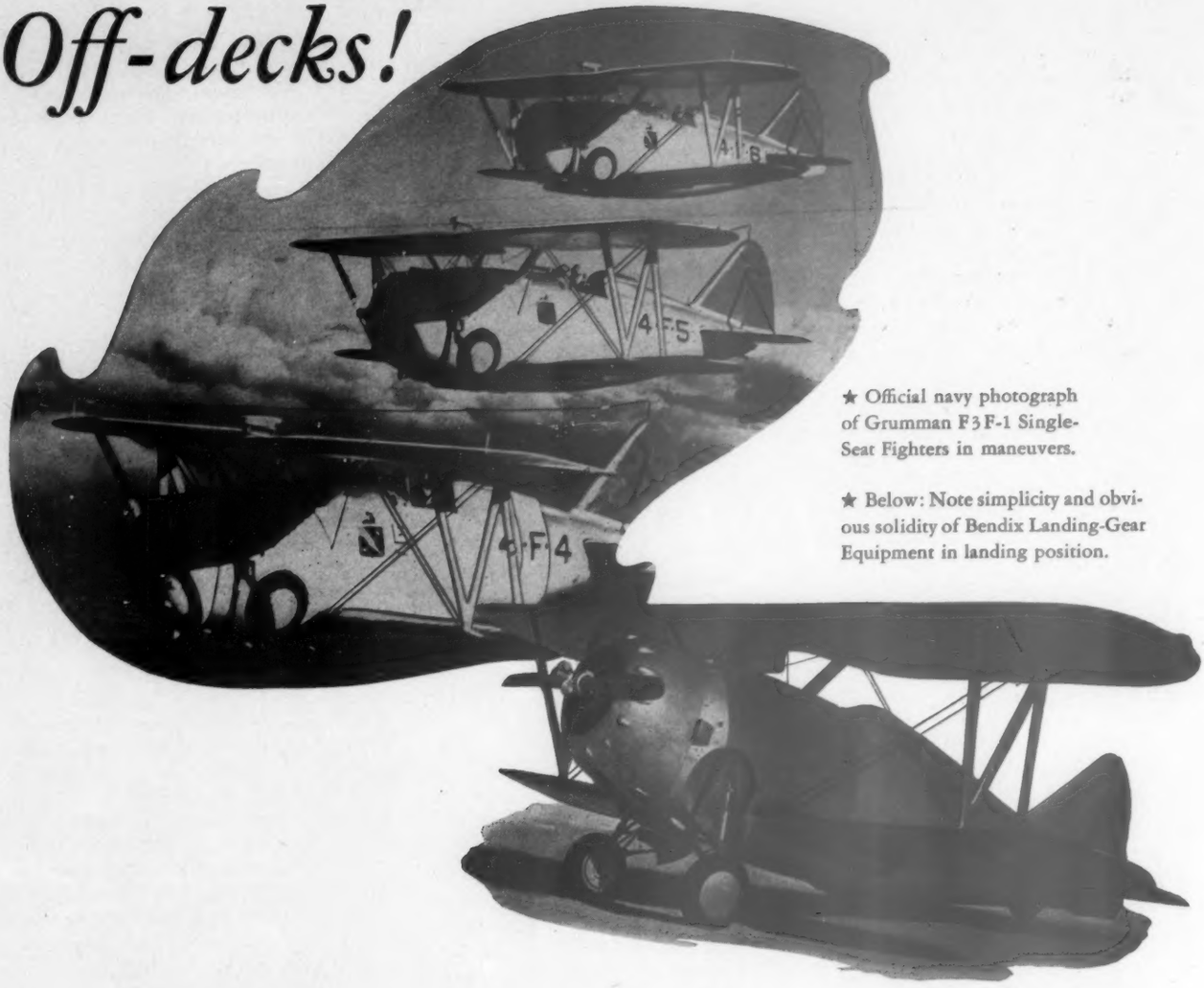
» **WE LOSE, CAA GAINS** the services of our esteemed Associate Editor, Dan Sayre. Come September 1st Mr. Sayre moves into Washington to become Director of the Bureau of Statistics and Information, the job left vacant by the appointment of C. B. Allen to the Safety Board earlier this year. We make this announcement with mingled feelings, for although we can derive satisfaction in having one of the members of the staff of AVIATION selected for this important C.A.A. post, we regret exceedingly that his services will be lost to this magazine. Mr. Sayre has made outstanding contributions to AVIATION, not only through his handling of the news section, which he has revamped and restyled completely during the last eighteen months, but as a feature writer and as a general associate in the carrying on of the work of the paper. We know that all our readers will join us in wishing him the best of luck on his new assignment.

» **ALSO TO WASHINGTON** goes the job of editing the AVIATION NEWS. With Mr. Sayre's departure, the focus of our news gathering and news comment will be shifted to our Washington office and will be in charge of Blaine Stubblefield. Mr. Stubblefield has long been connected with aviation and has been a very valuable contributor to the AVIATION NEWS during the past few years as a member of the Washington staff. Where, however, AVIATION affairs have been occupying only a relatively small part of his time, from here on the greatest part of his time will be earmarked for our use. He has an intimate knowledge of Washington affairs and the AVIATION NEWS can do nothing but benefit by his work and from the fact that his headquarters will stay in Washington.

BLAINE STUBBLEFIELD, who takes on the editorship of THE AVIATION NEWS, with headquarters in Washington.

DANIEL SAYRE, who leaves AVIATION'S staff this month to join the C.A.A. in Washington.

Off-decks!



★ Official navy photograph of Grumman F3F-1 Single-Seat Fighters in maneuvers.

★ Below: Note simplicity and obvious solidity of Bendix Landing-Gear Equipment in landing position.

The Navy's flying fighters need *"sea-legs"* too!

Supplying sturdy "sea-legs" to the navy's fleet of Grumman F3F-1 single-seat fighters, Bendix wheels, brakes and pneudraulic shock struts admirably meet the need for absorbing the impact shocks of landing on deck, or taxi-ing and take-off on terrain that is often none too smooth. Brakes that are capable, reliable *and nicely responsive,* facilitate ground maneuverability — steering as well as stopping. Off-decks, both struts and wheels retract smoothly into side wells in the fuselage.

Bendix

BENDIX PRODUCTS DIVISION
of Bendix Aviation Corporation, South Bend, Indiana

LANDING-GEAR EQUIPMENT

AIRPLANE WHEELS, BRAKES, PNEUDRAULIC SHOCK STRUTS, TAIL KNUCKLE ASSEMBLIES

Side Slips

By
ROBERT OSBORN

» THE SIDE SLIPS EDITOR is certainly getting around these days. Part of his copy came in by air mail from Detroit, part came in on horseback

from Wilkes-Barre, Pa. We saw him at Wright Field, carefully examining the details of what appeared to be the Intrepid Aviator's original Jenny. While he was deeply engrossed in the wing skid design, a civilian guard came along and told him he would have to report to the nearest Captain. The Captain gently but firmly reminded him that the ship he was examining so closely was in the restricted area.—ED.

» SOMETIMES we're absolutely amazed at the vision and ability to foresee the future that some men have. For instance, at the celebration of the Army Air Corps' 30th anniversary at Dayton, General Arnold revealed that one man put in a bid of $5,000,000 for the first military airplane, thirty years ago.

» IN GENERAL ARNOLD'S DESCRIPTION of the purchase of the first military airplane, we noticed another interesting side-light. Thirty years ago the Army was demanding performance beyond anything the designers could expect to meet,—but even that early the designers started delivering the performance the Army thought could be met.

» THE INTREPID AVIATOR was in the office the other day to help us unveil a new box of cigars and during the ceremony commented that he read where some officials of the State of Louisiana had been indicted in an alleged "hot-oil" scandal, and he thought he might have gotten some of that kind of oil in an engine that let him down in a wheat field recently.

» THE BUREAU OF STANDARDS has offered advice to aircraft manufacturers on methods of insulating the walls of airplane cabins against cold. That is just another illustration of the great progress being made in aircraft. Only a few years ago there wasn't any use insulating an airplane against cold when it wasn't even possible to get the engine started in cold weather.

» "TUCKERTON, N. J., JULY 9 (A.P.) —Two occupants of an airplane escaped injury when they were forced to land on a stretch of scrub pine land 6 miles north of Tuckerton, because of a rainstorm. The front end of their plane was damaged."

N. Y. Herald-Tribune.

» IF ONE LANDS FAST ENOUGH in that scrub pine land it is even possible to damage the back part of the airplane also.

» ONE of the cigarette manufacturers is now featuring testimonials from the various well known test pilots in the magazine advertising. Having had much to do with test pilots and their works over many years we must warn the advertising manager of the cigarette company that these testimonials lack a certain something which would make them more realistic to the people in the industry. The kind of a statement test pilot Joe Doakes, would be able to make at the field while a test program was actually under way would be something like the following:—

Test Pilot:—"I have always smoked El Ropo cigarettes and—"

Hangar Foreman: (In loud voice): —"Joe Doakes! Telephone!"

T. P.:—"Pardon me a moment, please."

T. P.:—(Returning) "As I was saying I've smoked El Ropo cigarettes for 6.4 years, reduced to standard, and—"

Engine Mechanic:—"Joe! I've busted off two of these thermocouple leads. You can get by without them, can't you?"

T. P.:—"Sure. I'll put down the same figures I got on the last climb." (Turning to Ad. Man) "Now, in regard to these All-Punk cigarettes —"

Ad. Man:—"Pardon me, Mr. Doakes, we're talking about El Ropo cigarettes."

T. P.:—"Oh yes! We're testing three models here now and I get kind of confused. Pardon me a moment, I just thought of something. Hey Jack! The handle for the anti-spin chute fell out of the pocket on the last trip, and got all wound up in the landing gear lever. Put a little safety wire on it, will you?" (Turning to

Ad. Man) "Now, what was it you wanted to see me about?"

Ad. Man:—"El Ropo Cigarettes."

T. P.:—"Oh, of course. Well, I've smoked—"

Hangar Foreman:—"Joe Doakes! Telephone!"

T. P.:—"Pardon me a moment, please." (As he returns, mechanic is warming up engine full throttle so both men have to shout.)

T. P.:—"Tell you what I'll do. Just leave me your address and I'll get a report off to you right away."

Ad. Man:—"Suits me fine. Let's do it that way. But how about really writing the report this time? This is the third trip you've promised it to me."

T. P.:—"Oh sure. Absolutely. Rely on it. I always get my reports in on time."

BENDIX – 1938
NX13
GREVE – 1938
Schuenfeldt
THOMPSON – 1938
29
PESCO
SPECIAL
THE THOMPSON TROPHY

AVIATION'S BIG SHOW— —or What of It?

Our West Coast Editor (old 1313-x), a dyed-in-the-wool enthusiast of many years' standing, uncorks some pent-up ideas on the past, present and future of

THE NATIONAL AIR RACES

By Charles F. McReynolds

AS WE WRITE this pre-race summary of 1939 National Air Race prospects the ballyhoo is well under way for aviation's annual side-show. By the time you read this the circus atmosphere will have pervaded Cleveland and the populace will be trekking airport-ward for its yearly glimpse of flying freaks. At this writing everything points to the most interesting air race meet since the series opened in Cleveland ten years ago, but the sad part of the picture is that this interest will have little relation to the industry proper. Each year the air race side show seems to draw farther away from the main tent of the industry.

In spite of the technical and competitive interest in this year's racing events, it is not impossible that another twelve months along the path racing is now following may leave the show stranded permanently. It is reported that total 1939 prize money will fall about $17,000 short of the 1938 purse. And this in the face of conditions which find the race plane builders scraping financial bottom. This year there will be only one new design at Cleveland so far as we know now, and it may not arrive. No new racers are under way for the 1940 season. A number of men who have been giving all or most of their time to race plane development have already turned their attention to other phases of aviation work. Increasing concentration of the industry on military work, and on the development of small private planes, or large transport planes, is tending to divorce the industry completely from the highly specialized field of race plane design and construction.

This condition is a striking contrast to the fact that technical experimentation was never at a higher level, or in a more interesting field. A host of engine design experiments are being tested. New spark plugs, piston rings, fuels, etc., are being tried on a large scale. Engines like Schoenfeldt's and Chester's Menascos have only an external resemblance to the factory design from which these racing engines have been developed. Changes include novel fuel induction systems, entirely new cylinders, cylinder head finning, spark plug location, new pistons and

rings, new counterbalanced crank shaft, special valves, camshafts, etc. One of the new race planes, rebuilt from last year, is of plastic plywood construction. Various combinations of wing plan form, airfoil section, angle of incidence, etc., are putting in an appearance.

But in spite of all interest in the current program we cannot look ahead with any enthusiasm to future air race meets. After all a side-show is something that detracts from the main performance, unless run under the same management on a coordinated basis. This magazine has repeatedly pointed out the urgent need of direct industry control of air racing if it is to continue. But we find the industry at the best aloof, and at the worst hostile to air racing. Industry people are often heard to remark that air racing doesn't "contribute" anything to the sciences of aviation.

Possibly the reason lies in the lack of a program under which such contributions might be made. No one really familiar with the detailed work done by many race plane builders would deny that they might be able to contribute to the improvement of military and commercial designs if given the proper incentive and opportunity. In the rapidly changing world of aviation, with air power of paramount importance to national defense, every kind of high speed experimentation and research is of vital importance to the country as a whole. Private research along air racing lines could be a vital part of our future high speed development program. But under the present lack of industry interest it is just a side-show to amuse the people of Cleveland and vicinity. Obviously, the average spectator who attends the Cleveland races regards the midget speedsters and their pilots with all the awe he would Halley's Comet, should it suddenly swoop down and start doing pylon turns around the ten mile course. Doubtless many of the spectators regard the "dare-devil" pilots either as supermen with nerves of steel, the eyes of an eagle, and the muscles of Tarzan, or else they consider them out-and-out lunatics, want-wits, or willing suicides. Perhaps not one in a hundred credits these men with being rather normal young patriots with a sincere desire to contribute something definite to the advancement of the art and science of aviation, and to the establishment of American flying ahead of competing foreign countries.

Obviously, these fellows are not governed by a "get-rich-quick" complex. They have all gone broke year after year and still continue in the game. And it is equally obvious that they are not primarily motivated by a greed for fame, since few of the pilots and none of the designers get newspaper space (with slight exceptions) outside of the city of Cleveland.

But in spite of lack of recognition, and lack of money, the race people have doggedly carried on the battle. And it is still true that, with all the aircraft design and engineering work now in progress, these race meets present the public with its only opportunity to step up and see full scale research being conducted at an accelerated pace in full view of the whole world. If a new type landing gear doesn't work the result is obvious. If an engine innovation backfires just when things seemed to be looking up, the engine usually does something dramatic for the benefit of the assembled multitude. Certainly this public testing of engines, propellers, fuels, structural and aerodynamic novelties, could be better dramatized for both the public and industry. The race management has gone the limit on whooping up the drama, but until and unless the industry takes hold the whole show will continue on much the same basis as a carnival merry-go-round, with a fury of sound and motion, but always arriving back at the starting point after not having been anywhere in the meantime.

You'll Meet Them at the **RACES**

Old 1313-X sizes up the planes, the pilots, and their chances in aviation's big Labor Day show. Turn the page for the 1939 form sheet.

By
Charles F. McReynolds

Lee Williams left, and Bob Bean center, re-grooming the veteran *Miss Los Angeles.*

Art Chester takes great care in balancing the connecting rods of his Menasco engine.

Art Chester and his mechanic, Lynn Coffold, seem pleased with the *Goon's* prospects.

Lee Williams, left, will fly *Miss Los Angeles*. Bob Bean pilots the *Floyd Special*.

Bill Schoenfeldt, designer of the *Firecracker*, to be flown by Tony LeVier.

Harry Crosby, designer, builder, and pilot of the *Crosby Racer*.

Tom Floyd, designer and co-owner of the *Floyd Special*.

AS for the 1939 Cleveland side show. As usual, the races open with the Bendix trans-continental dash. This classic event may assume more importance in future as the public awakens to the military significance of these quick transcontinental trips. Especially as the leading Bendix racers continue to be planes of military type. Although Inez Gibson, of Burbank, Calif., has been announced as a probable starter, we are inclined to believe that Jacqueline Cochran will be the lone woman in a field of men pilots when the flag drops at Union Air Terminal.

Incidentally, Dudley Steele, airport manager, is grooming his field for a take-off crowd of 50,000 persons. Last year there were some 35,000 on hand for the event. Several new rules will be applied to the start this year by Chief Starter Larry Therkelson. At the time of writing it appears possible that a wooden man will be on hand to send away the metal planes, as Edgar Bergen is considering letting Charlie McCarthy stay out late that night to act as honorary starter. In any case the Bendix racers are being impounded at noon on the day of the start, or, since the first ship off will leave sometime between midnight and daybreak, the planes are actually being impounded the day before the start. They will be placed on display along the airport fence where spectators may come quite close to them during the day for inspection.

It is not chivalry alone that prompts us to select Jacky Cochran as the favorite out of a field of experienced men pilots, including Vance Breese in the Hughes Racer, and Frank Fuller in his veteran Seversky. For Miss Cochran has obtained one of the new-

est modification of Army pursuit type Seversky's, we are told. Such a plane should have a definite advantage over Fuller's veteran Seversky, and may even surpass the highly touted Hughes Racer.

As this is written the entry of the Hughes plane is still in doubt. The ship is now the property of the Timm Aircraft Corp. and design work is being pushed on development of a military pursuit modification with higher power. Timm is understood to have purchased full design rights from Hughes and also to have the continuing cooperation of Hughes and his engineers in development of the new pursuit. Obviously a victory for the Hughes racer at this time would benefit the military design program being conducted by Timm. But there are rumors that Paul Mantz, and perhaps other pilots, are bidding for the Hughes racer because of the prize winning potentialities it holds. In any case the plane and its Pratt & Whitney engine are in excellent shape. Vance Breese has been engaged to fly the ship from Newark, where it is now stored, to Burbank before the start of the race. There remains the possibility that someone may buy the Hughes racer and enter it in the Thompson Trophy, due to the higher purse. We are inclined to believe it is a better ship for cross country work, but Richard Palmer, designer of the Hughes, feels that the aspect ratio of six to one makes it particularly efficient on pylon turns. In any event the general public is at last to have a close-up view of the Hughes racer in actual competition.

And notwithstanding the new Seversky to be flown by Jacky Cochran, and the proven capabilities of the Hughes, we expect to see Frank Fuller close to number one spot in Bendix standings. His plane is in shape and he has polished up his piloting and navigation with a distinguished list of inter-city speed flights in recent months. It is quite possible that we may see another neck-and-neck finish among these three favored contenders.

An outsider who may break into the winner's circle is the ill-fated Bellanca tri-motor racer flown by Frank Cordova. This plane has suffered a series of misadventures and so has never had

RACE PLANES

AVIATION

Plane Name	Pilot Designer Owner	Colors	Design	Engine	Landing Gear	Span	Wing Area	Gross Weight
Beechcraft	Bob Perlick Stock-Factory		Biplane	Wright Cyclone	Retrble.	32 ft.	296.4 sq. ft.	4,200 lbs.
Beechcraft	Max Constant Stock-Factory		Biplane	P &W Wasp Jr.	Retrble.	32 ft.	296.4 sq. ft.	4,200 lbs.
Bellanca	Jacqueline Cochrane Frank Cordova Bellanca		Tri-motor cantilever monoplane	Ranger and two Menasco C6S4 engines	Retrble.			
Chester "Goon"	Arthur C. Chester " " "	Cream	Mid-Wing cantilever monoplane	Menasco C6S4 modified	Retrble.	18 ft. 6 in.	66 sq. ft.	1,680 lbs.
Crosby CR-4	Harry Crosby " "	Silver and blue	All-metal low-wing monoplane	Menasco C6S4	Retrble.	16 ft.	64 sq. ft.	1,940 lbs.
Delgado Flash	Byron Armstrong Delgado Trades School	Black	Cantilever low-wing monoplane	Menasco C6S4	Fixed	17 ft.	60 sq. ft.	1,560 lbs.
Floyd Special	Bob Bean Tom Floyd Bean - Floyd	Yellow, Brown and Red trim	High mid-wing cantilever monoplane	Menasco B6S	Retrble.	13 ft., 10 in.	58 sq. ft.	1,500 lbs.
Folkerts	Delbert Bush Clayton Folkerts		High mid-wing cantilever monoplane	Menasco C6S4	Retrble.			
Hughes Racer	Vance Breese Richard Palmer Timm Aircraft Corp.	Dark blue	Low-wing cantilever monoplane	P & W Twin Wasp Jr.	Retrble.		138 sq.ft.	4,900 lbs.
Lockheed Orion	Paul Mantz Lockheed-Stock Paul Mantz		Low-wing cantilever monoplane	Wright Cyclone	Retrble.	42 ft., 9½ in.	294 sq.ft.	5,800 lb.
Marcoux-Bromberg	Earl Ortman Keith Rider H. C. Marcoux	Yellow and black	Low-wing cantilever monoplane	P & W Twin Wasp Jr.	Retrble.			
Miss Los Angeles	Lee Williams L. W. Brown Marion McKeen	Internti. orange	Low-wing wire-braced monoplane	Menasco B6S	Fixed	21 ft.	75 ft.	1,737 lbs.
Northrop Gamma	Inez Gibson Northrop-Stock Inez Gibson	Silver	Low-wing cantilever monoplane		Fixed	47 ft. 9½ in.	363 sq.ft.	7,350 lbs.
Rider "8-Ball"	Joe Jacobson Keith Rider Union Airplane Co.	Dark blue	Low-wing cantilever monoplane	Menasco C6S4	Retrble.	18 ft.	75 sq.ft.	1,800
Schoenfeldt "Firecracker"	Tony LeVier Rider-Schoenfeldt Wm. Schoenfeldt	Yellow	Low-wing cantilever monoplane	Menasco C6S4 modified	Retrble.			
Seversky	Jacqueline Cochrane Seversky Factory Jacqueline Cochrane	Silver	Low-wing cantilever monoplane		Retrble.			
Seversky	Frank Fuller Seversky Factory Frank Fuller	Silver	Low-wing cantilever monoplane	P & W Twin-Row Wasp	Retrble.	38 ft.	223 sq.ft.	5,730 lbs.
Turner Special	Roscoe Turner Turner-Laird Roscoe Turner	Cream	Mid-wing cantilever monoplane	P & W Twin Wasp Sr.	Fixed			
Vultee	Wilbur Shaw Vultee-Stock Wilbur Shaw	Silver	Low-wing cantilever monoplane	Wright Cyclone	Retrble.	50 ft.	384 sq.ft.	10,174 lbs.
Wedell-Williams	Lt. Joe Mackey James Wedell Roscoe Turner	Cream	Low-wing wire-braced monoplane	P & W Hornet	Fixed			
Wittman "Bonzo"	S. J. Wittman " "	Red	Mid-wing wire-braced	Curtiss D-12	Fixed	17 ft.		

RACE

1 BENDIX TROPHY

Los Angeles-Cleveland-New York

Total purse **$27,500**

2 GREVE TROPHY

200 miles, 20 laps

Total purse **$20,000**

3 THOMPSON TROPHY

300 miles, 30 laps

Total purse **$37,500**

a chance to show what it can do. Powered with two Menasco C6S4 engines, and one Ranger 12, the Bellanca could come close to winning and may do just that. If Paul Mantz doesn't fly the Hughes racer he will try again with his Lockheed Orion with which he took third last year. In any case the Orion will probably be flown in the race by some pilot. It has been thoroughly prepared and should do no worse than fifth, maybe again a third. Close back of the Orion may come the two Beechcrafts to be flown by Bob Perlick and Max Constant. And if the leaders suffer trouble either of these planes may come home in front. Inez Gibson, Burbank aerial charter service operator, has been preparing for the race by flying a Northrup Gamma, possibly the same ship used by Hughes to set a transcontinental record. We suspect that Inez may relinquish the controls in favor of a male contestant, and in any case the Northrop is probably not fast enough to press the race leaders. Also listed as a possible starter is Wilbur Shaw, Indianapolis race winner, with a Vultee. Shaw is an experienced pilot and may place high. Certainly the entry of both the Hughes and the new Seversky, and the continuing competition offered the men by Miss Cochrane, makes this 1939 Bendix Trophy race a classic contest.

On Sunday the closed course racing is opened with the Greve Trophy. No better crowd-pleaser has ever been staged than the 1938 battle between Tony LeVier and Art Chester. Both boys are back again, with their planes in better trim than ever, so another ding-dong speed-fest is a cinch. However, the situation is intensified by the readiness this year of the new Folkerts, which may be even faster than Chester's *Goon* or LeVier's Schoenfeldt *Firecracker*. Also, Keith Rider has completely revamped the *8-Ball*, and a very promising new plane from the Coast, the *Floyd Special*, is being flown by Bob Bean. Furthermore, Harry Crosby has his plane in the best condition to date and may finally show some of the speed which has been promised at former race meets. This gives the spectators a possible six contenders of theoretically equal possibilities. We have guessed that all six

1939 RACING FORM

(based on best available information at the time of going to press)

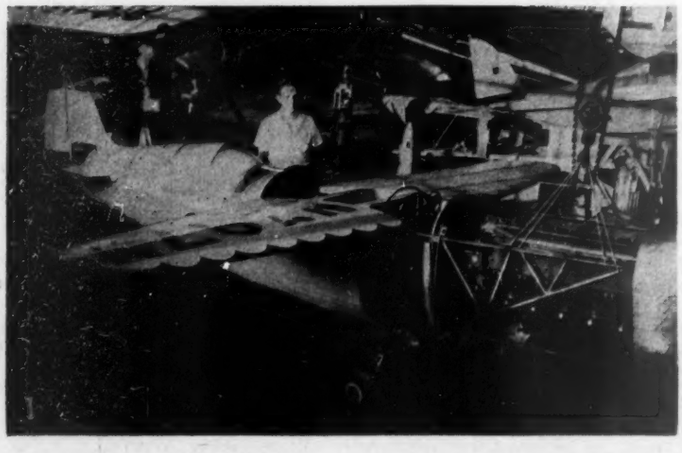
FINISH POSITION	PLANE	PILOT	TIME	REMARKS
1.	Seversky	Jacqueline Cochrane	7 hr.	Three cheers for American women.
2.	Hughes Special	Vance Breese	7 hr. 10 min.	Not good enough to beat the new Seversky.
3.	Seversky	Frank Fuller	7 hr. 30 min.	Not fast enough to beat the Hughes racer.
4.	Bellanca	Frank Cordova	8 hr.	About time this plane won something.
5.	Lockheed Orion	Paul Mantz	9 hr.	Mantz may fly the Hughes racer. A good chance in any case.
6.	Beechcraft	Bob Perlick	10 hr.	This is fast flying, but not fast enough.
6a.	Beechcraft	Max Constant	10 hr. 30 min.	
7.	Northrop	Inez Gibson	11 hr.	Doubtful start, doubtful finisher.
8.	Vultee	Wilbur Shaw	12 hr.	May fly the race just to get ready for 1940.
1.	Schoenfeldt	Tony LeVier	275 mph	Logical favorite to repeat 1938 win.
2.	Chester Goon	Arthur C. Chester	274 mph	This will be anybody's race until the flag drops.
3.	Folkerts	Delbert Bush	273 mph	May wind up on top of this dog fight.
4.	Rider 8-Ball	Joe Jacobson	272 mph	Joe won't be dallying, has good chance to win.
5.	Crosby CR-4	Harry Crosby	271 mph	Harry may wind up in fifth place, but he won't be far behind the leaders.
6.	Floyd Special	Bob Bean	270 mph	A newcomer, but with lots of speed. With a little luck may get up in front.
7.	Miss Los Angeles	Lee Williams	240 mph	A good old girl, but in fast company.
8.	Howard Mike	.....	230 mph	May race for old times sake.
9.	Delgado Flash	.....	225 mph	Might surprise us, but not much.
*				
1.	Chester Goon	Arthur C. Chester	300 mph	Just a hunch.
2.	Turner Special	Roscoe Turner	295 mph	The field is too classy for the Colonel.
3.	Wittman "Bonzo"	S. J. Wittman	290 mph	The old maestro may do better.
4.	Folkerts	Delbert Bush	280 mph	A Folkerts won in 1937, might in 1939.
5.	Marcoux-Bromberg	Earl Ortman	275 mph	About tops for this ship.
6.	Schoenfeldt	Tony LeVier	274 mph	Can't win all the time—or can he?
7.	Rider 8-Ball	Joe Jacobson	273 mph	Another Menasco year—watch these babies.
8.	Crosby CR-4	Harry Crosby	272 mph	About due for some good luck—may be nearer the front.
9.	Floyd Special	Bob Bean	271 mph	If he does alright in the Greve he'll do better in the Thompson.
10.	Wedell-Williams	Lt. Joe Mackey	260 mph	Old reliable—flying for gasoline money.
11.	Miss Los Angeles	Lee Williams	240 mph	This plane should pay her way.
12.	Delgado Flash	.....	230 mph	Might tag along just to see the fun.

*The Hughes Racer may be entered in the Thompson. If so we still rate one of the 550 jobs first. the Hughes second, and Turner third.

would perform within a five mile per hour speed range of one another, somewhere between 275 and 270 mph. So the whole group may come tearing up to the line in a blanket finish. And we are inclined to feel conservative about predicting a Greve speed of 275 mph. Although this is 25 mph faster than any previous Greve speed, we won't be surprised if the Greve time this year beats Turner's Thompson Trophy record of 1938. Also entered for the race are Marion McKeen's *Miss Los Angeles,* to be flown by Lee Williams, and Byron Armstrong's *Delgado Flash.* There is a rumor that Benny Howard's *Mike* may be entered by its present owner. In any case these three planes are definitely in the also-ran category and will hardly turn in times of better than 225–240 mph.

This year the most interesting design work has been done, we think, among the Greve Trophy class ships. Wm. Schoenfeldt has built a new wing for his *Firecracker* as the original wing was badly damaged in a crash landing at the close of last year's Greve Trophy race. Schoenfeldt is a one-man research center and has picked from the best available American and foreign design information in laying out his new wing, and modifying his propeller, engine, cowling, etc. The new wing is not radically different, though using a more recent airfoil than the previous one. A most interesting nose cowl has been worked out to obtain maximum aerodynamic efficiency to-gether with adequate engine cooling. The nose is symmetrical in plan form and extended to give a tunnel scoop effect to the engine cooling air intake. The propeller to be used this year is a development from experimentation with more than a dozen different wood propellers. The engine itself has been so completely modified from the original that it is more nearly a Schoenfeldt than a Menasco engine. Schoenfeldt, Chester, and other Southern California engine experimenters, have had generous collaboration from Winfield, Offenhauser, and one or two other producers of special auto racing engines and equipment. The Schoenfeldt engine is equipped with salt cooled valves, special camshafts, special rings and pistons, and a radical induction system which makes use of a duplex manifold so balanced as to accomplish nearly perfect distribution of the intake gasses. The Schoenfeldt engine runs cool and smooth. Even with the fixed wood propeller which is engineered for high speed performance, the plane gets off the ground as fast or faster than any of its competitors. How well prepared the *Firecracker* is may be judged by the fact that it was loaded on the trailer ready to leave for Cleveland after a test hop of only twenty minutes early in July.

STRANGELY ENOUGH if we favor the Schoenfeldt racer to win the Greve because it is already packed on its trailer, we favor Art Chester to win the Thompson because he is still test flying his racer repeatedly here in the middle of August. Last year Chester literally threw the *Goon* to-gether, test-hopped it just before the races at Cleveland, and was able to give Tony LeVier a classic race for the Greve laurels. Since then Art has completely overhauled plane, engine, and all accessories. He has put several hours of test flying on the plane, made a host of changes in his engine, and is still hard at work. We know something of Art's almost uncanny ability in an all-around way as designer, builder and pilot. He is almost in a class by himself in the single-handed single-minded way in which he develops his race planes. We strongly suspect that he will turn up at Cleveland with a stick of dynamite in each hand and an airplane-full of surprises for some of the competing pilots. A little later on we'll use two or three words to explain why we pick Tony LeVier to win the Greve, over Art,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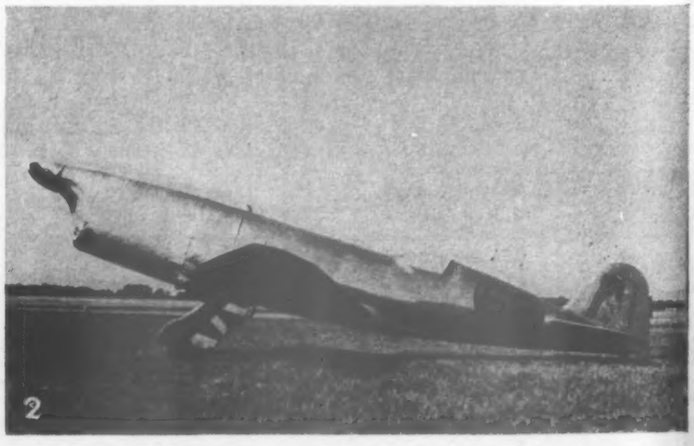
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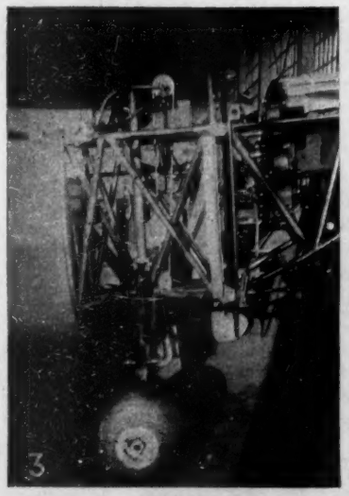

3

4

5

6

and then dope Art to cop the big Thompson purse.

Meantime lets take a birds-eye look at Art's baby, the *Goon*. She's a honey from prop to skid. The propeller is a two-pitch French Ratier, and as the blades are adjustable on the ground Art has been able to do some experimenting on determining most efficient pitch angle for top speed. The tail skid is fully retractable hydraulically, as are the main landing wheels. Art even developed a special trick latch to hold one of the two wheels up in the wheel well. This was necessary as the hydraulic retracting mechanism works directly on one strut and retracts the other through a connecting torque tube. On pylon turns this torque tube has just enough spring to let centrifugal force shove the right wheel down and spring open the belly door, knocking about 20 mph off the Gonn's speed. Other innovations on the Goon include a skin type oil radiator under the belly, a semi-venturi exhaust stack system which should add some propulsive effect at speeds in the neighborhood of 300 mph.

But it is with his engine that Chester has really entered into the spirit of pure research, conducting single-handed a program that would do credit to a major organization. The original Menasco C6S4 engine is now but a shell of its former self and the test of Art's engine engineering ability will come in the Greve and Thompson. Ripping out the innards of his stock engine, Art has installed a counter-balanced crankshaft, new pistons and rings, has carefully balanced the connecting rods, hand fitted all the gears, designed and installed an entirely different set of cylinder heads to provide for cross-flow cooling over the heads as well as cylinders, re-positioned the spark plugs, changed the design of the cylinder intake and exhaust ports, installed a radically different pressure-equalizing intake manifold of his own design to achieve uniform fuel distribution at high speeds, installed special sodium cooled valves; etc.

WE SHOULD INTERPOLATE a word of comment on the standard Menasco engine. These changes are not any reflection on the engine as it comes from the factory for commercial use. They are merely one man's way of seeking to run the standard engine at power output and rpms far beyond normal. It may be remembered that the Menasco C6S4 with which Rudy Kling won the 1937 Thompson Trophy was a stock engine in almost every way.

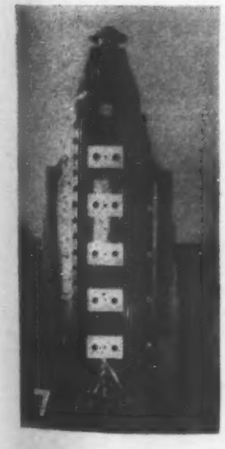
Art has solved the crankcase breather question by installing ten openings instead of one, and feeding them into a special equalizing chamber. Result is a saving on oil, and some improvement in cooling. We could go on and on, but the reader will appreciate by this time that if Art comes through in the Thompson he will have pulled himself up by his bootstraps.

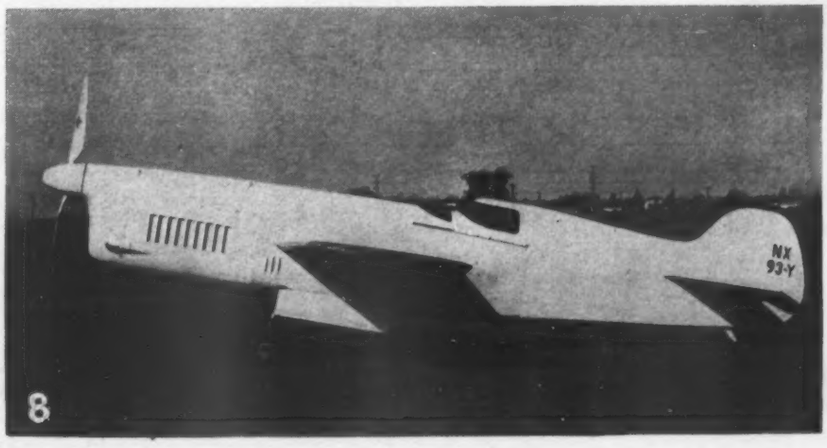
We haven't been able to get any details on the 1939 Folkerts, except that it has a new wing and is gosh-awful fast. Clayton Folkerts is one of these speed wizards who seems to be able to pick additional miles per hour out of a hat. He would be a major asset to most any big aircraft firm, but prefers to pursue the even tenor of his way "down on the farm" building one good plane at a time. Where Clayton's career will wind up we can't guess. He is a swell fellow. But we do know that his planes will command respect in any company. We may have slipped a cog in not figuring the Folkerts to win both Greve and Thompson this year as it did in 1937. Del Bush is inexperienced, but so was Rudy Kling.

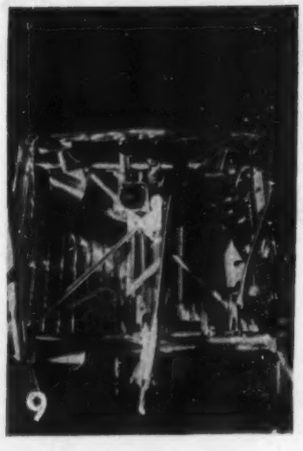
Another designer of the Folkerts type is Keith Rider, who is really the grand old man among current race plane builders, having been consist-

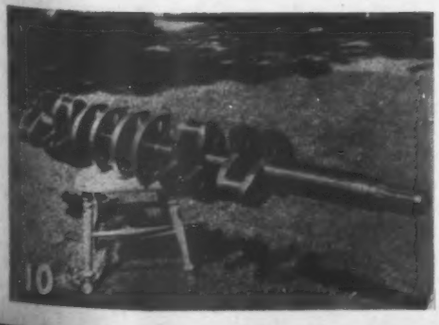
(*Turn to page* 42)

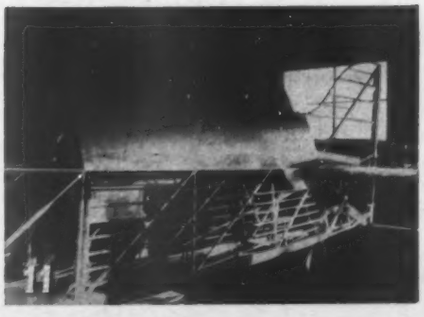
1. Bob Bean with the Floyd Special. (Details of this machine below: 3. Close-up of landing gear. 4. Final inspection of wing assembly, total 48 sq. ft.). 2. Harry Crosby's CR-4 racer is all metal. (Below: 5. Crosby's magnetos are shielded against engine heat and cooled with a fresh air duct. Fuel lines are asbestos wrapped to prevent vapor lock. 6. Simple spring steel tail skid on Crosby's CR-4.) 7. Art Chester's modified Menasco engine has ten crank case breathers instead of the usual single outlet. 8. Major threat for the Greve and Thompson, Chester's beautiful racer, the Goon. 9. Looking down into the Goon's cockpit, showing inside surface of skin-type oil radiator, retracting gear controls, etc. 10. Counterbalanced crank shaft for Chester's special Menasco. 11. Rear portion of Goon's fuselage, uncovered, showing oil tank, reserve fuel tank, landing gear, hydraulic tank, pumps, and accessories. 12. Detail of Goon's retractable landing gear, showing left wheel retracted and held in place with positive locking device.

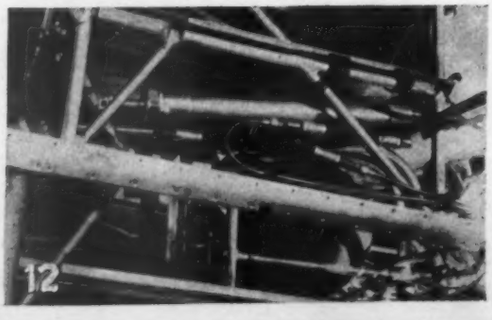








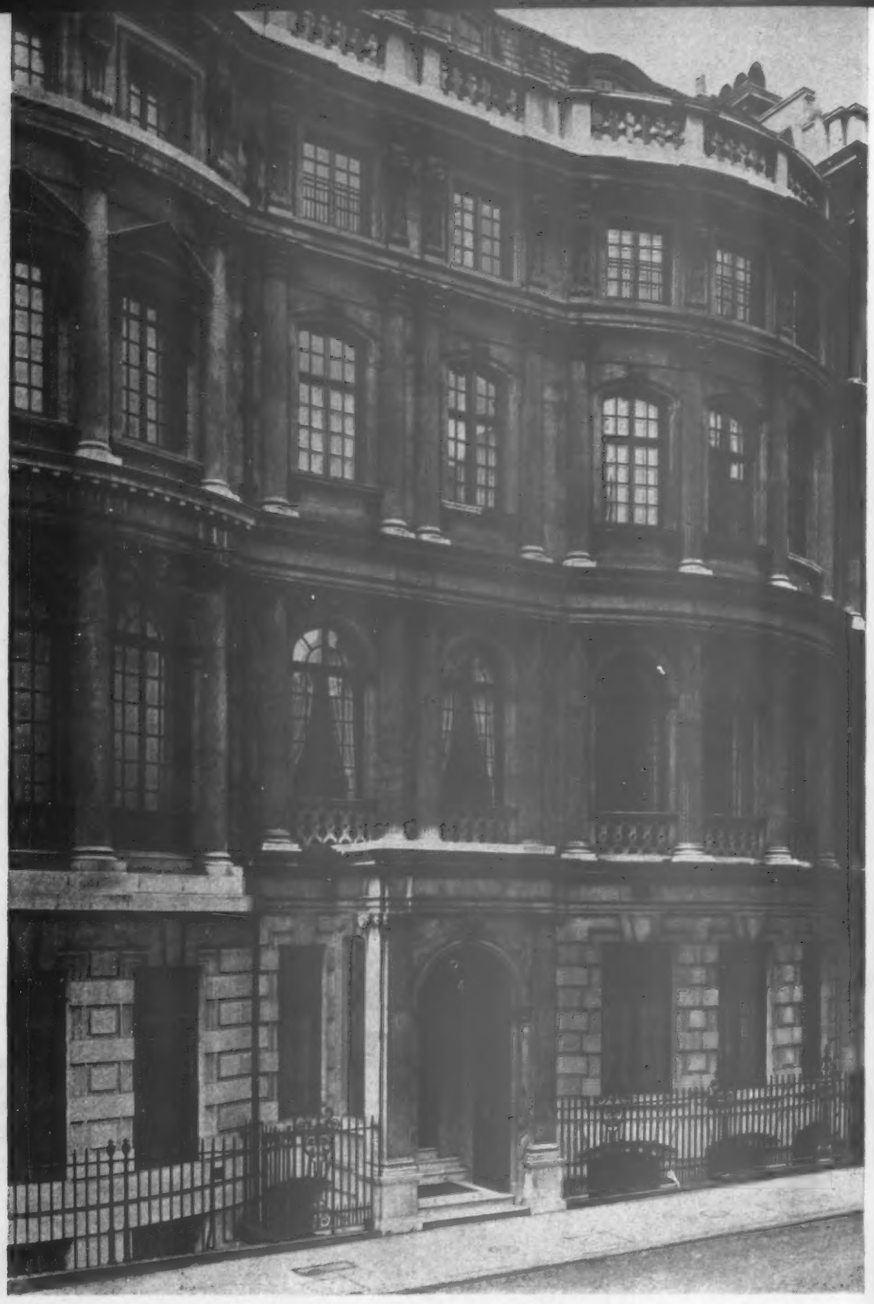




A NEW HOME for

ROYAL AERONAUTICAL SOCIETY

1866

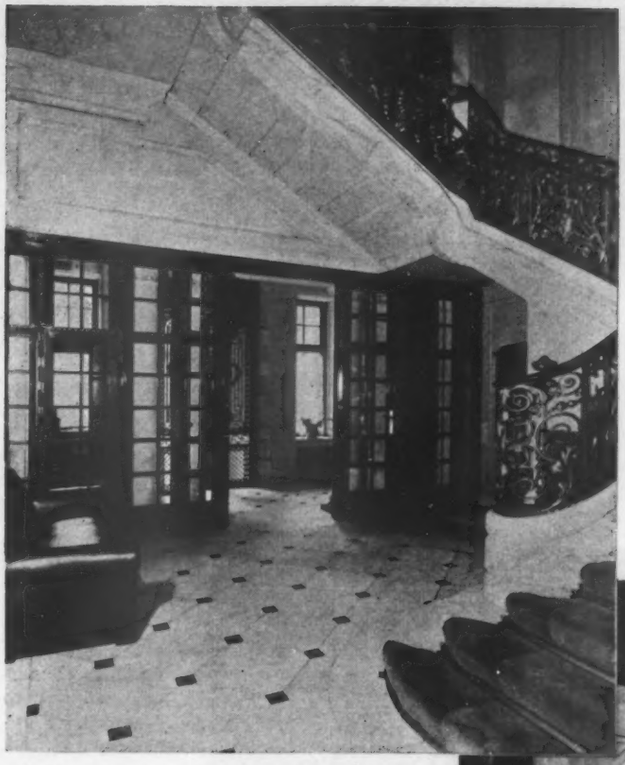


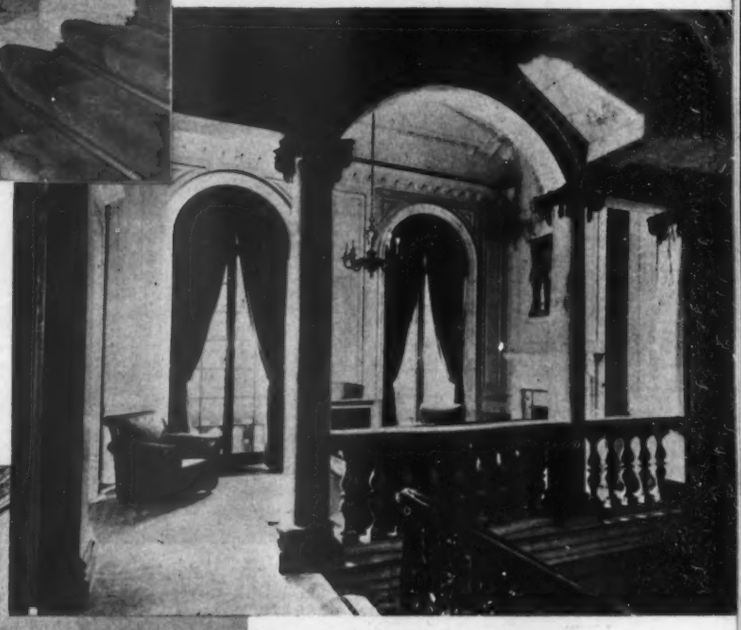
OLDEST institute of aeronautical sciences is Britain's Royal Aeronautical Society, founded on January 12, 1866, in the days when balloons were the only method of getting people into the air. From its earliest days, however, its members have been convinced of the feasibility of heavier-than-air flight and have bent their energies in that direction. To prove it, we have only to mention a list of some of the outstanding members, names now indelibly engraved in the history of aviation,—Glaisher, Stringfellow, Lilienthal, Pilcher, Maxim, Horatio Phillips, Sir William Crookes and Orville Wright.

Earliest meetings were held in Argyll Lodge, Campden Hill, and at Stafford House, or at the private addresses of the secretaries. It was not until 1902 that the Society had its own offices, a room at 35 Victoria Street, Westminster "for the office and library of the Society at a rental of £20 per annum." Rapid interest in aviation forced a move to 11 Adams Street in 1911 and later,—1917, to the offices at No. 7 Albemarle Street, the location long since familiar to American visitors as Captain Pritchard's headquarters.

To many of us, hours spent in the old library, followed by tea with Lawrence Pritchard and his staff before a crackling fire will remain as pleasant high-lights of a London sojourn.

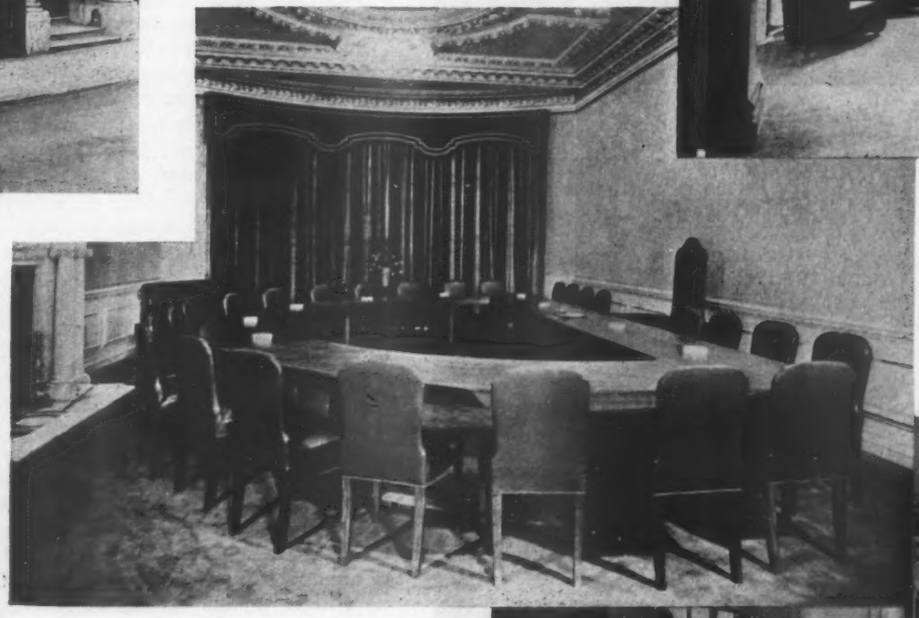
After 22 years' tenancy in Albemarle Street the Society has again outgrown its quarters, and, through the generosity of its friends and members has moved to a handsome new home at 4 Hamilton Place, near Hyde Park corner and Park Lane. The building was dedicated with appropriate ceremonies on June 16 and 17, 1939, and is now available for the use of members of the Society and for distinguished aviation visitors from all over the world. Our photographs give an idea of the decorations and facilities, fitting housing for an ancient and honorable institution.





Above: Entrance hall and main marble staircase leading up to library and committee rooms. Right: Top of staircase at library level. Over the fireplace may be seen portrait of the Duke of Argyll, first president of the Society.

Above right: One of the two smaller committee rooms. Furniture is in mahogany, upholstery in deep brown.



Left: The council room. The D-shaped table is a unique idea. Society crest (shown on opposite page) is embossed on the back of the presidential chair.

The library which houses the R.A.S. collection of historical books, pamphlets, and rare prints. The lighting is indirect, walls and windows have been soundproofed. Color scheme,—walnut and green.

Electrical Insulation for AIRCRAFT

By
Graham Lee Moses

Insulation Engineer
Westinghouse Elec. & Mfg. Co.
East Pittsburgh, Pa.

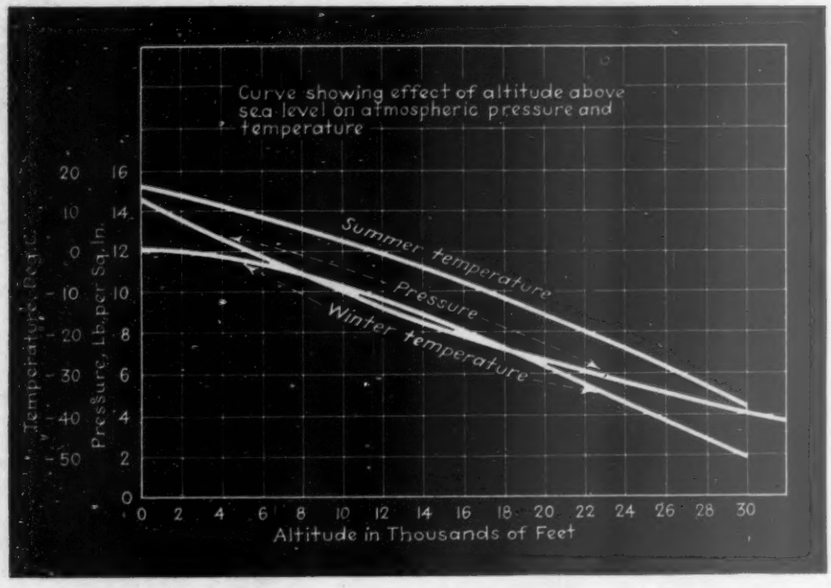

Curve showing effect of altitude above sea level on atmospheric pressure and temperature
Summer temperature
Pressure
Winter temperature
Temperature, Deg. C.
Pressure, Lb. per Sq. In.
Altitude in Thousands of Feet

Fig. 1

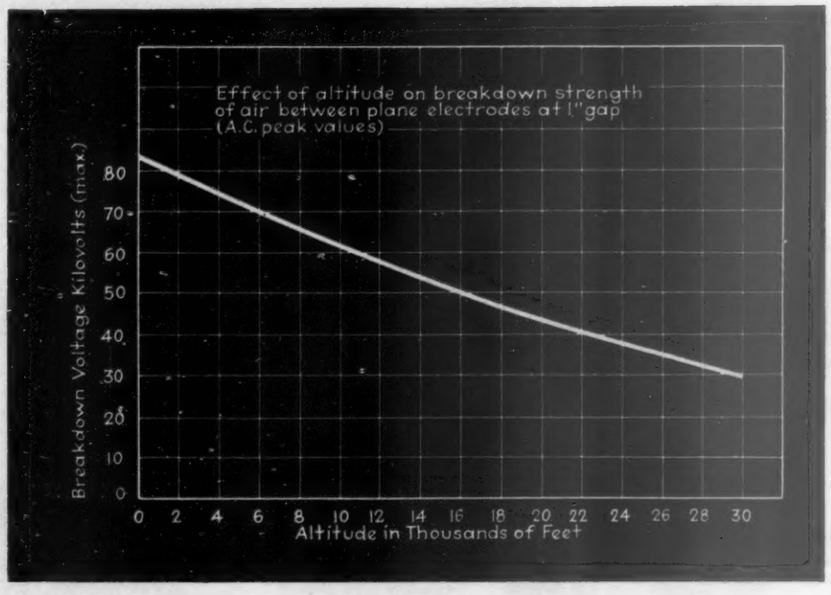

Effect of altitude on breakdown strength of air between plane electrodes at 1" gap (A.C. peak values)
Breakdown Voltage Kilovolts (max.)
Altitude in Thousands of Feet

Fig. 2

THE tremendous strides recently made in the development of aircraft have necessitated important changes in electrical equipment for aviation service. The electrical system on larger aircraft has outgrown its prototype, the automotive or bus type of low voltage D.C. system. With the greater demand for electrical energy on aircraft has necessarily come an increase in D.C. voltage or a change to A.C. systems which also utilize higher voltages. The use of these higher voltages completely changes the picture of the insulation problem on aircraft electrical equipment. Since extreme changes in altitude, pressure, temperature and humidity have an important effect on insulation, it seems timely to consider these and determine their general effect upon insulation design. From such a study it is possible to set up simple standards of insulation tests and minimum creepage distances for the various voltage classes.

Changes in altitude result in very great differences in atmospheric pressure and ambient temperature. The effect of altitude on ambient temperature and atmospheric pressure is shown in curve Fig. No. 1.

Atmospheric pressure has an important effect upon the dielectric breakdown characteristics of air and upon surface "flashover" voltage. Curve Fig. No. 2 indicates the effect of atmospheric pressure as determined by altitude on the breakdown voltage of air. The effect of reduced atmospheric pressure in "flashover" voltage for a typical material is shown in curve Fig. No. 3 for various electrode spacings. These latter values are only comparative as the type of sur-

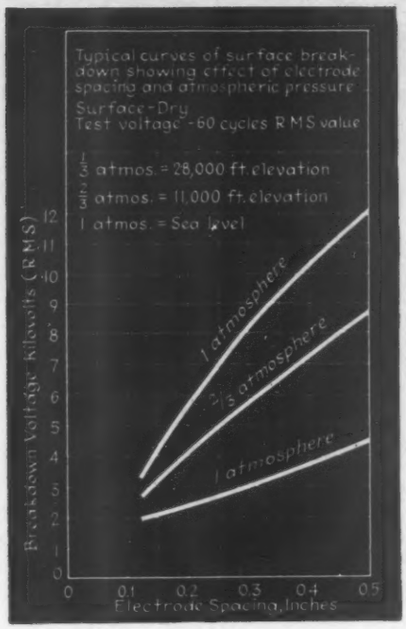

Typical curves of surface breakdown showing effect of electrode spacing and atmospheric pressure
Surface-Dry
Test voltage-60 cycles R.M.S. value
1/3 atmos. = 28,000 ft. elevation
1/2 atmos. = 11,000 ft. elevation
1 atmos. = Sea level
1 atmosphere
1/2 atmosphere
1/3 atmosphere
Breakdown Voltage Kilovolts (R.M.S.)
Electrode Spacing, Inches

Fig. 3

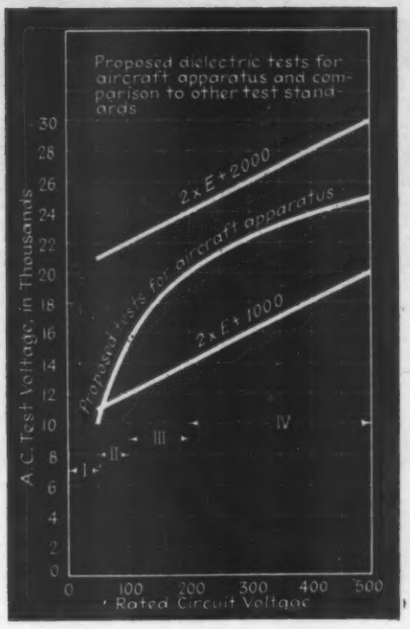

Proposed dielectric tests for aircraft apparatus and comparison to other test standards
2 x E + 2000
Proposed tests for aircraft apparatus
2 x E + 1000
A.C. Test Voltage, in Thousands
Rated Circuit Voltage

Fig. 4

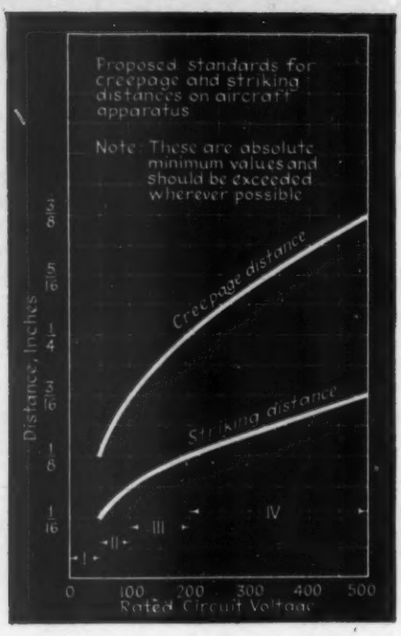

Proposed standards for creepage and striking distances on aircraft apparatus
Note: These are absolute minimum values and should be exceeded wherever possible
Creepage distance
Striking distance
Distance, Inches
Rated Circuit Voltage

Fig. 5

face and several other variables have an important effect on this factor. From these curves it is clear that atmospheric pressure, and therefore altitude, play an important part in determining the ability of many parts of electrical apparatus to withstand voltage strains.

Quick changes in altitude resulting in sudden variations in pressure and temperature often cause the precipitation of moisture on insulating surfaces. This still further complicates the problem of insulating aircraft electrical apparatus as the "flashover" voltage is still further reduced by this phenomenon.

The great variation in ambient temperature with altitude results in similar changes in operating temperature of the electrical equipment. Due to the differences between coefficients of expansion of insulation, steel, aluminum and copper these temperature differences impose severe mechanical stresses upon the insulation.

From a study of the effect of these variables on insulation, it can readily be seen that the problem of insulating electrical equipment for aircraft service is widely different from insulating conventional equipment. The duty imposed in aviation service is most nearly comparable to that encountered in railway service, however, even this duty is not as severe as in aircraft service. One particularly important difference is that railway apparatus is not subjected to reduced air pressures that occur in aviation service.

In selecting a tentative standard for insulation dielectric breakdown tests, the expected voltage range has been divided into four classes. Factory test voltages have been selected which are based somewhat on railway practice as established by A.I.E.E. Standards No. 16 with increased values in some cases which are based on judgment and laboratory tests.

Rated Circuit Voltage (A.C. or D.C.)	*Proposed One Minute Test Voltage**
0 to 50	1000
51 to 100	1500
101 to 200	2000
201 to 500	2500

* Test voltages are 60 cycles RMS values.

Those test voltages constitute a test of the ability of the solid insulation to resist puncture. They are not intended as a factory test of creepage surfaces. When apparatus is new, clean and dry the ability of the creepage surfaces to resist flashover is very high. It has been found that the ratio of flashover voltage under factory test conditions to that under service conditions is very great. For example on one standard material the flashover voltage at atmospheric pressure was reduced 72½% by the presence of moisture on the surface and the reduction in air pressure to ⅓ atmosphere. Therefore, a voltage which would be a satisfactory test of a creepage surface when clean and dry would be an excessive strain on the solid dielectrics. It is, therefore, necessary to establish creepage distance which will be satisfactory under the most adverse condition.

A considerable amount of laboratory work has been done in determining the effects of pressure, spacing, moisture and type of surface on flashover voltage. This data is too voluminous to be repeated here but the characteristic of a typical dry material is shown in curve Fig. No. 3. From the data obtained in these tests the following creepage distances were established as minimum values. Wherever it is possible to increase these values without seriously handicapping the apparatus it should be done.

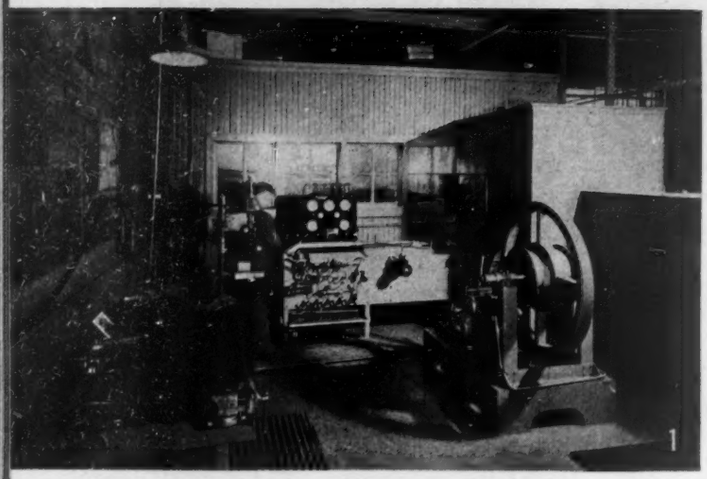
Rated Circuit Voltage	*Recommended Minimum Creepage Distance*
0 to 50	1/8"
51 to 100	3/16"
101 to 200	1/4"
201 to 500	3/8"

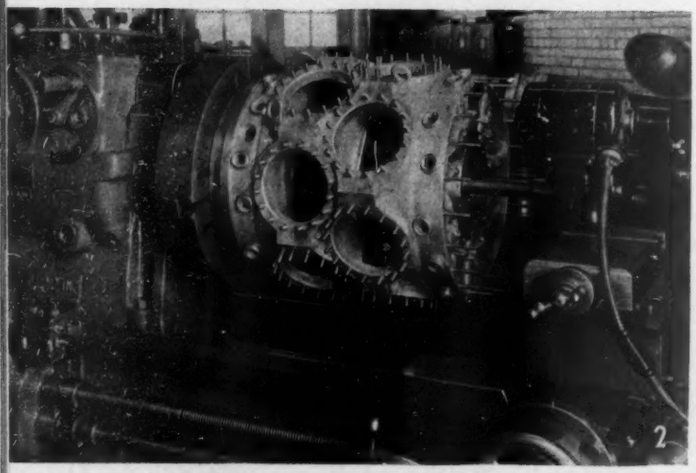
Likewise it is necessary to establish minimum striking distances through air where no creepage path exists or it is greater than recommended above. These values should also be considered as absolute minimum and be increased wherever possible.

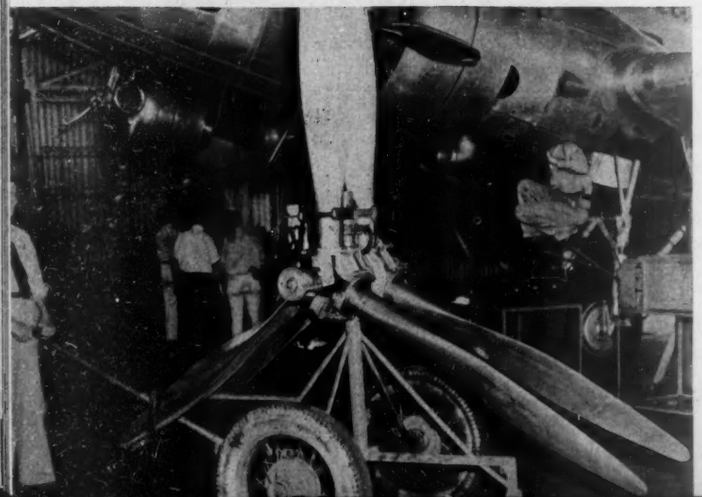
Rated Circuit Voltage	*Recommended Minimum Striking Distance*
0 to 50	1/16"
51 to 100	3/32"
101 to 200	1/8"
201 to 500	3/16"

A great deal of development work has been done and much progress has been made in producing electrical apparatus suited to the needs of the aviation industry. However, it must be recognized that it is only a beginning. Insulation is a phase of the electrical art which is too often taken for granted. The foregoing data and recommendations are offered in the hope of giving a better general picture of the insulation problem.

AVIATION'S Maintenance Note Book







1. Braniff's wheel and hydraulic overhaul shop at Dallas. The hydraulic test bench in the background and the brake grinding and test equipment at the right were designed and built by Braniff.

2. United uses this set-up for installation of main case liners on twin-row engines. The accuracy of the alignment must be held to .0005 in. by indicator. Special fixture mounted on lathe face plate developed by U.A.L.

3. Eastern Air Line's propeller handling dolly at Miami shops.

4. Pan American uses these portable racks for big propellers for the Clippers at Miami.

5. Hydraulic jack for Douglas airplanes built by P.A.A. at Brownsville.

6. T.W.A. test stand for direct-drive Eclipse starters. Hydraulic pressure developed in cylinder at end of torque arm is indicated on a gage calibrated to read in pounds.

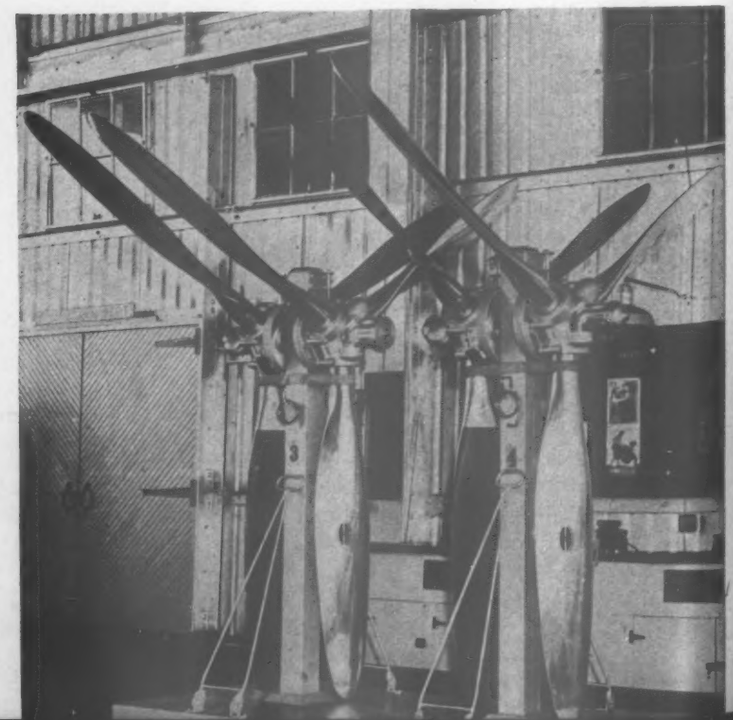
7. Device developed by Pennsylvania Central to straighten air flow through carburetor.

8. Hydraulic type starter test stand built by P.A.A. at Rio de Janeiro.

9. P.A.A.'S system for serving down mooring lines on beach.

10. A pair of I beams embedded in concrete makes a convenient stand for engine mount attachment, U.A.L., Cheyenne.

11. Servicing platform and auxiliary equipment for Sikorsky type aircraft, P.A.A., Miami.



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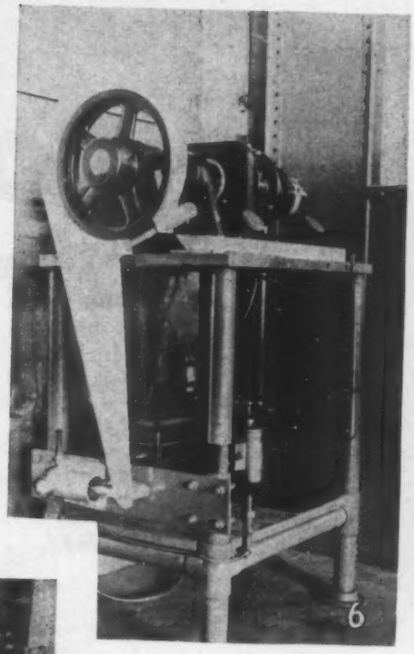
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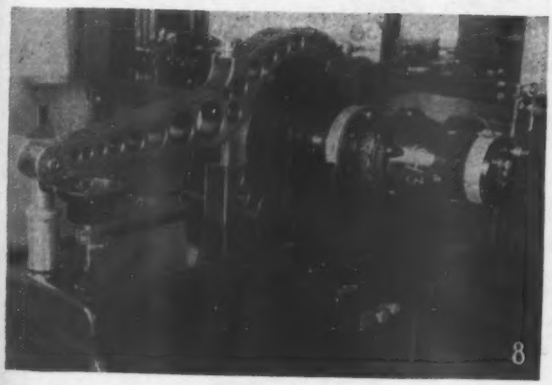
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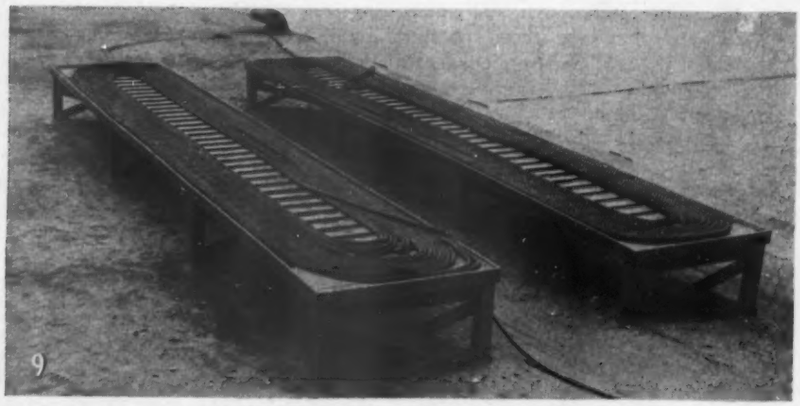
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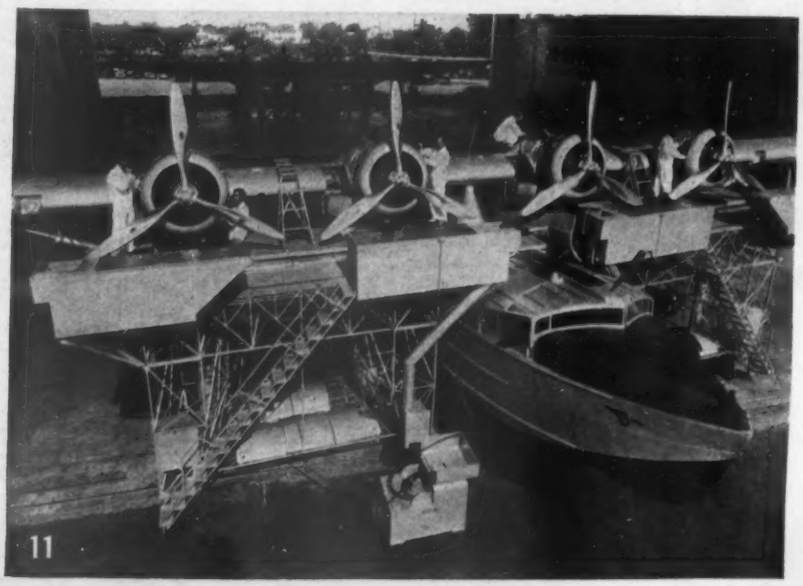

11

Making Use of GROUND EFFECT

The author discusses the theoretical aspects of the subject and shows how it can best be used by the pilot.

By Prof. Allen H. Blaisdell
Carnegie Institute of Technology

ON VARIOUS OCCASIONS during the last eighteen years the results of theoretical studies and experimental investigations have been published in the Technical Press of Europe and the United States, dealing with the flight phenomenon commonly referred to as "floating," "cushioning," and "pancaking." Such performance vagaries are conveniently classified under the single term of "ground effect," for they are only experienced during the take-off and landing of airplanes when relatively close to the ground surface. Pilots are familiar with "ground effect" and sometimes find it rather troublesome in the case of certain airplanes and under some conditions of operation.

The entire subject is still hazy in spite of the attention given to it by a number of investigators, and there is sufficient divergence between wind-tunnel and test-flight results to justify suspicions of the experimental methods used in many cases. Among the more impressive and interesting of test data are those obtained by Elliot G. Reid and Kenneth F. Ridley* and published by the National Advisory Committee for Aeronautics. The tests of Ridley were among the most comprehensive up to that time, being made upon eleven airplanes of differing design and construction. Calculations based upon the test data appeared to check the commonly accepted aerodynamic theory of "ground effect" so closely that further and more thorough consideration of the subject seemed unnecessary. But such was not the case since continued progress in theoretical and applied aerodynamics, together with parallel developments in power units, led to marked changes in design, changes which greatly increased both the size of airplanes and the wing loadings. Flight speeds continued to mount to higher limits, and the take-off and landing problem assumed more serious proportions.

* Report No. 265, N.A.C.A. T. N. No. 349, N.A.C.A.

What is "Ground Effect"?

When flying an airplane close to the ground, within a depth zone which varies from a value equal to the full wing span down to the point of actual contact of the landing wheels with the ground surface, the pilot may observe that there is more than normal delay in reduction of speed down to that best suited for making the landing proper. In other words, there is a prolongation of the lift usually accompanied by a reduced demand on the power plant. An impressive idea of the action is best obtained by attending some of the gliding and soaring contests, and observing the extended flight of a glider as it skims along at a height of one or two feet above the surface of the landing field. The pilot sometimes finds it difficult to bring his craft down onto the field surface. Similar effects arise when landing seaplanes and flying boats, although now the interference surface is composed

Fig. 1. Diagram of physical character of ground effect for still air conditions.

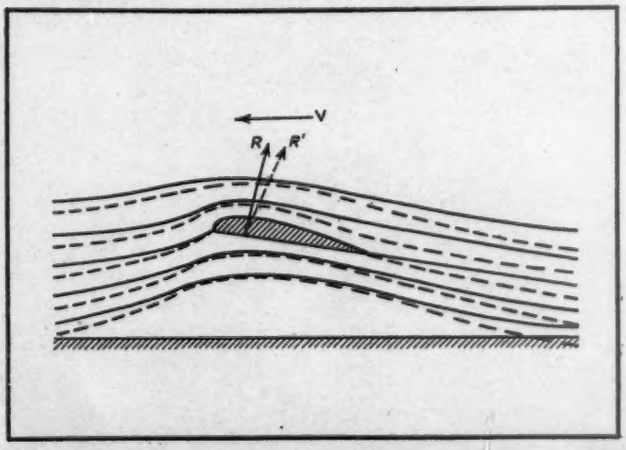
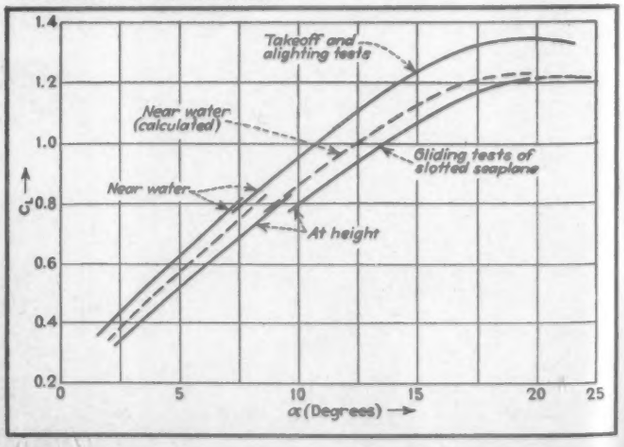


Fig. 2. Interference action of the ground surface and other factors on the lift coefficient.



of water and not land.

"Ground effect" has a great deal to do with the take-off performance of heavily loaded airplanes. In such cases the ground effect enables the airplane to get off from the landing field surface with engines well out, the climb speed at first being momentarily high and then starting to decrease before the airplane has passed out of the ground interference zone. If the engines are full out, it may be impossible to attain a flight altitude of more than forty or fifty feet, to be followed by a forced landing. The use of controllable pitch propellers and supercharged engines have done much to minimize this difficulty.

Physical Characteristics of "Ground Effect."

The physical character of "ground effect," for still air conditions, may be roughly picturized as shown in Fig. 1. The diagram indicates how the ground surface spreads out or flattens the streamlines of the body of air surrounding the wing. The broken lines represent the effect of the moving wing on the air when free of the ground interference. The streamlines are deflected upward toward the leading edge of the wing, and downward from the trailing edge. In a wind tunnel, where the wing is at rest and the air in motion about it, this bending or flexure of the air stream is quite impressive, and is found to extend a very considerable distance into the air region about the wing. The resultant air force on the wing is represented by the vector R′, the tilt of the vertical being proportional to the angle of attack α. When the wing is now moved adjacent to a solid boundary, the stream lines have their curvature markedly reduced, and assume a shape somewhat as indicated by the solid line curves. The resultant air force R′ on the wing is now rotated toward the vertical and its point of application, or the center of pressure, moves toward the leading edge. Of course, the relative amounts of streamline distortion are not constant along the span of a wing, since the nature of the air flow varies over the latter, particularly at large angles of attack when the air loading builds up toward the wing tips.

Now this straightening out of the flow lines means a decrease in the "downwash" angle, bringing about thereby a reduction in the induced drag, but probably having no effect on the profile drag unless circumstances allow the wing to come exceptionally close to the ground surface. This lowering of the induced drag is precisely the effect of an increased aspect ratio; that is, the wing performs as though it possessed a new, apparent, or fictitious aspect ratio greater in magnitude than its actual or geometric aspect ratio. From airfoil theory we learn that the greater the aspect ratio of a given wing, the smaller the angle of attack corresponding to a given value of the lift coefficient C_L, and therefore the higher the flight speed for a given airplane loading. This means that ground effect acts to decrease the effective angle of attack of a wing below that indicated by its position with respect to the relative wind. Referring to Fig. 2, the lower solid line represents the C_L curve for flight conditions outside of the ground effect region, while the upper solid line shows the interference action of the ground surface, the slope of the curve becoming steeper accompanied with possibly some increase in the maximum value of the lift coefficient. The stall occurs at a lower value of α, and in some cases may account for "pancake" landings which occur when the pilot still believes his airplane flying at a non-stall angle and speed.

Magnitude of the "Ground Effect."

The most commonly accepted and best known of the theories of ground effect is that proposed by Prandtl and Wieselbergs many years ago, which furnishes the simple correction formulae:

$$\Delta\alpha_i = \frac{\delta C_L}{\eta n} \times 57.3; \quad C_{Di} = \frac{\delta C_L^2}{\eta n} \qquad (1)$$

where $\Delta\alpha_i$ is the number of degress by which the geometrical angle of attack of a wing should be decreased for a given height above the ground surface, while C_{Di} is the corresponding amount by which the induced drag coefficient should be reduced. The coefficient "δ" is the Prandtl interference factor, and its value depends on the wing span "b" and the mean height "h" of the wing (lower wing, if a biplane) above the surface. "n" is the geometric aspect ratio.

It is easily shown that if "n'" is the apparent or effective aspect ratio when an airplane is flying within the zone of "ground effect," then

$$n' = \frac{n}{1 - \delta} \qquad (2)$$

The formulas were derived on the basis of still air conditions, and should not be applied for angles of attack

(*Turn to page 77*)

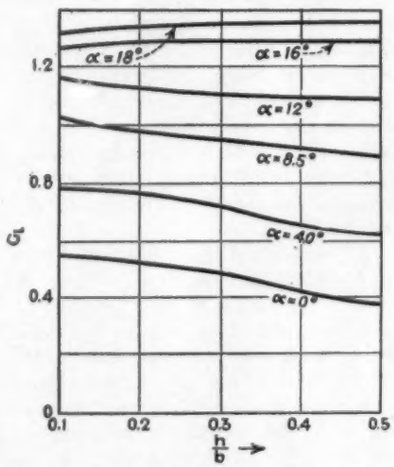


Fig. 5. Effect of changes of the height-span ratio on the lift coefficient for different values of the geometric angle of attack.

Fig. 3. How the interference factor varies with the height-span ratio.

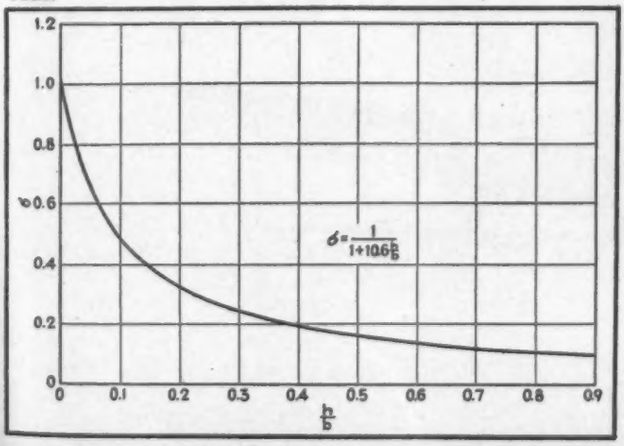
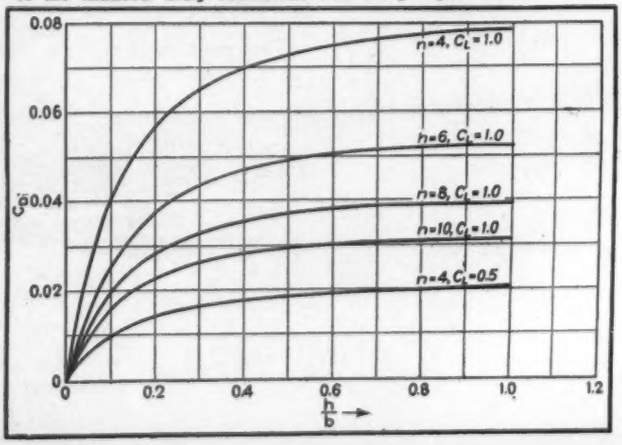
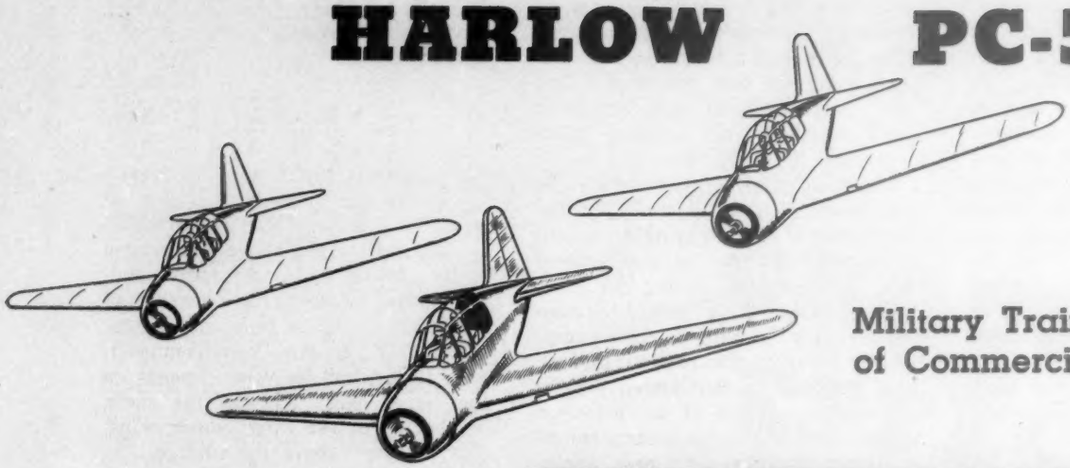


Fig. 4. Effect of different geometric aspect ratios on the change of the induced drag coefficient with height-span ratio.



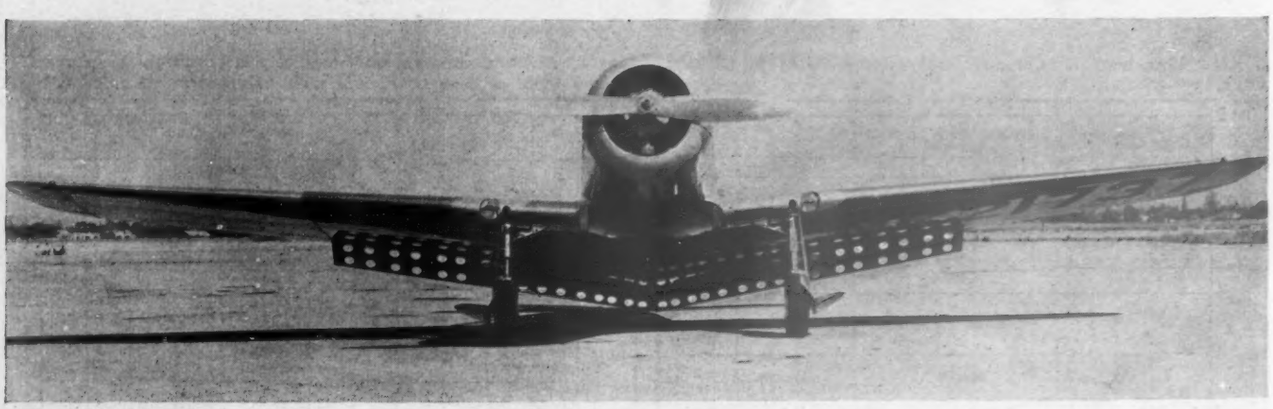
HARLOW PC-5



Military Trainer is Adaption of Commercial Design

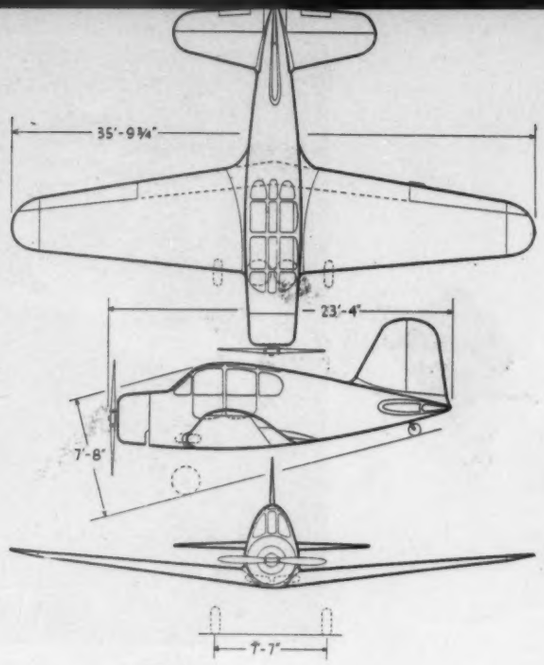
BRANCHING into the field of all metal training ships the Harlow Aircraft Company has recently completed their new low wing PC-5. Ease and convenience of instruction has been incorporated in the design as can be seen in the lower picture and drawing on the opposite page. The wide windows and transparent roof provide unrestricted visibility in all directions. Included in the equipment are the electrically operated flaps, that can be stopped up to any position up to 45 degrees, controllable pitch propellor and retractable landing gear, all of which can be introduced to the student step by step.

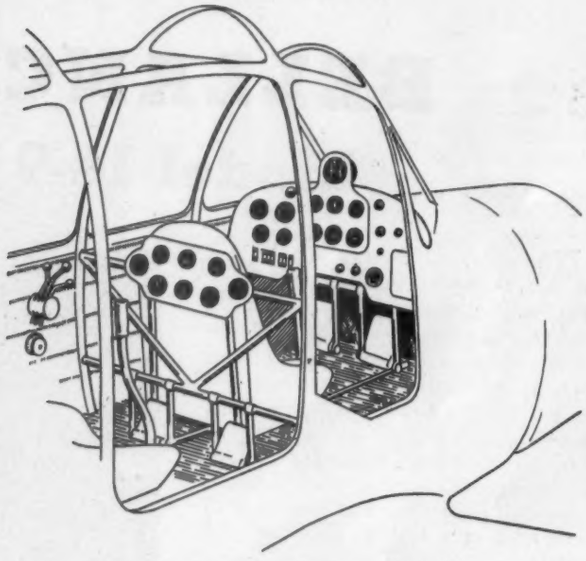
The wings and fuselage are all metal the latter being semi-monocoque in design. A series of transverse rings and longitudinal extrusions form the frame work with 24 ST Alclad sheet riveted on. The tail surfaces and wings are also of Alclad with a tab on both the elevators and rudder. The power plant is a Warner *Super Scarab* which develops 145 h.p. and blends in smoothly with the fuselage.

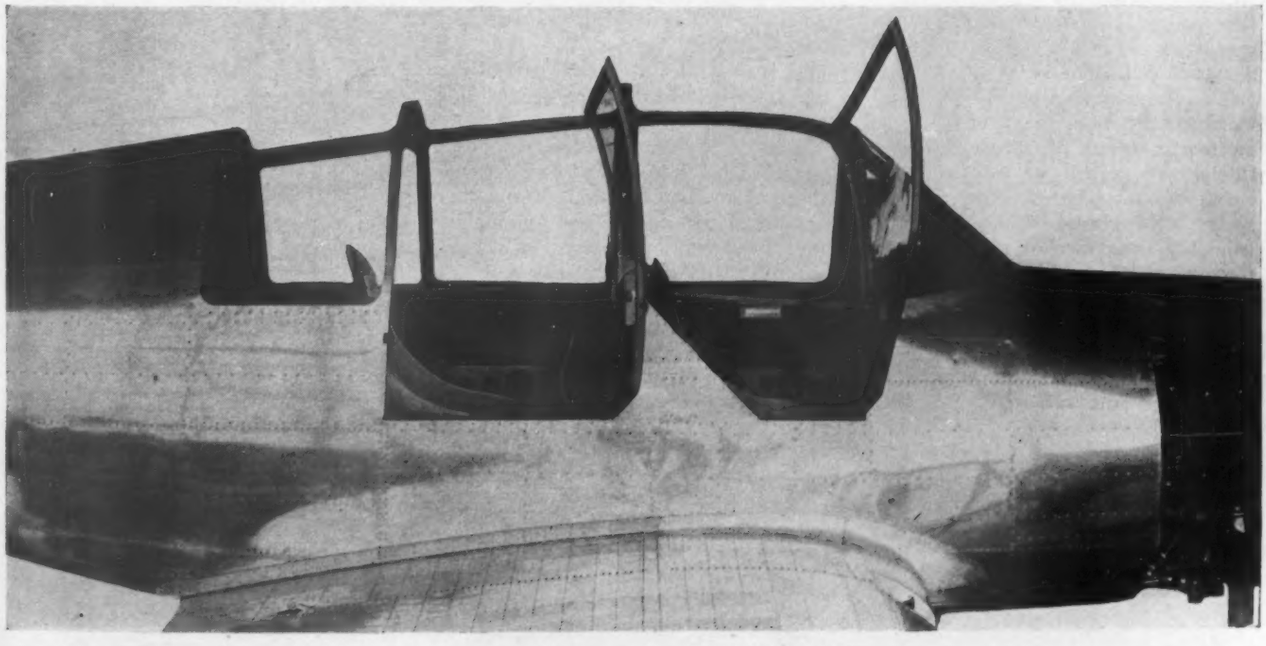


SPECIFICATIONS

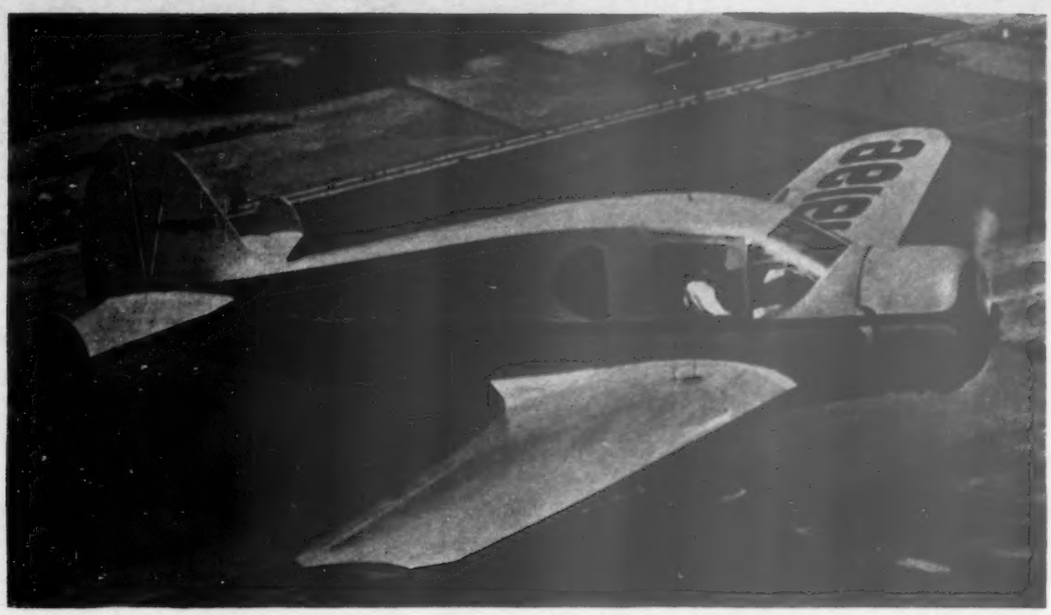
Wing span	35 ft. 9.75 inches	Rudder area	10.9 sq.ft.
Length overall	23 ft. 4 inches	Elevator area	17.12 sq.ft.
Height overall	7 ft. 8 inches	Stabilizer area	21.2 sq.ft.
Wing area	185 sq.ft.	Flap area	23.6 sq.ft.
Wing loading	12.31 lbs./sq.ft.	Maximum speed	170 m.p.h.
Power loading	15.71 lbs./hp.	Cruising speed	160 m.p.h.
Empty weight	1640 lb.	Landing speed	45 m.p.h.
Useful load	639 lb.	Rate of climb	850 ft./min.
Gross weight	2279 lb.	Service ceiling	16,500 ft.
Aileron area	13 sq.ft.	Cruising range	600 miles







Flying Equipment



BELLANCA
Model 14-9

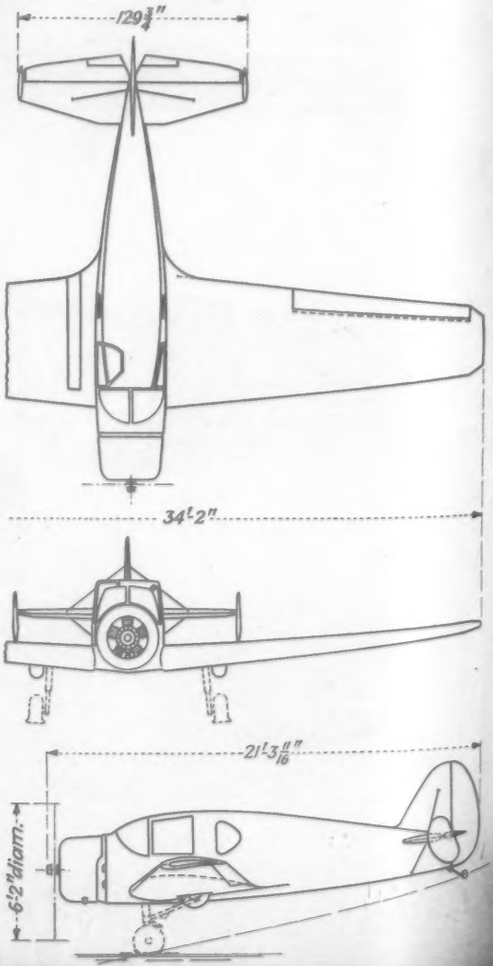
An answer to the call of the CAA for spinless private planes is the Bellanca model 14-9. Among its safety features are two auxiliary fins mounted at the tip of the stabilizer, which are intended to counter-act the tendancy of the ship to spin. This together with the use of the Bellanca "B" airfoil section, noted for its very favorable stall characteristics, gives stability to the plane and enables it to be landed at a high angle. Powered with a LeBlonde 90 hp. engine the model 14-9 lands at 47 m.p.h. cruises at 120 m.p.h. and can climb to a service ceiling of 14,000 ft.

The structure is of semi-wood and metal construction, the wings for the most part being of spruce and the fuselage of normal welded steel tube construction. The covering of the wing is of plastic bonded plywood from the front face of the rear spar forward and around the leading edge and back to the rear spar. The trailing edge of the wing and the aileroms are fabric covered, as is also the wing tip bay. A feature of the wing construction is the fact that the wing fillet is made as an integral part of the wing, thus eliminating the necessity of a separate metal fairing fillet.

The design of the fuselage follows the standard Bellanca form being the shape of an airfoil section. Inside, the upholstering is in the best automobile tradition, with one passenger behind the pilot and co-pilot's seat with all three facing forward. The right hand dual control arrangement is readily removable.

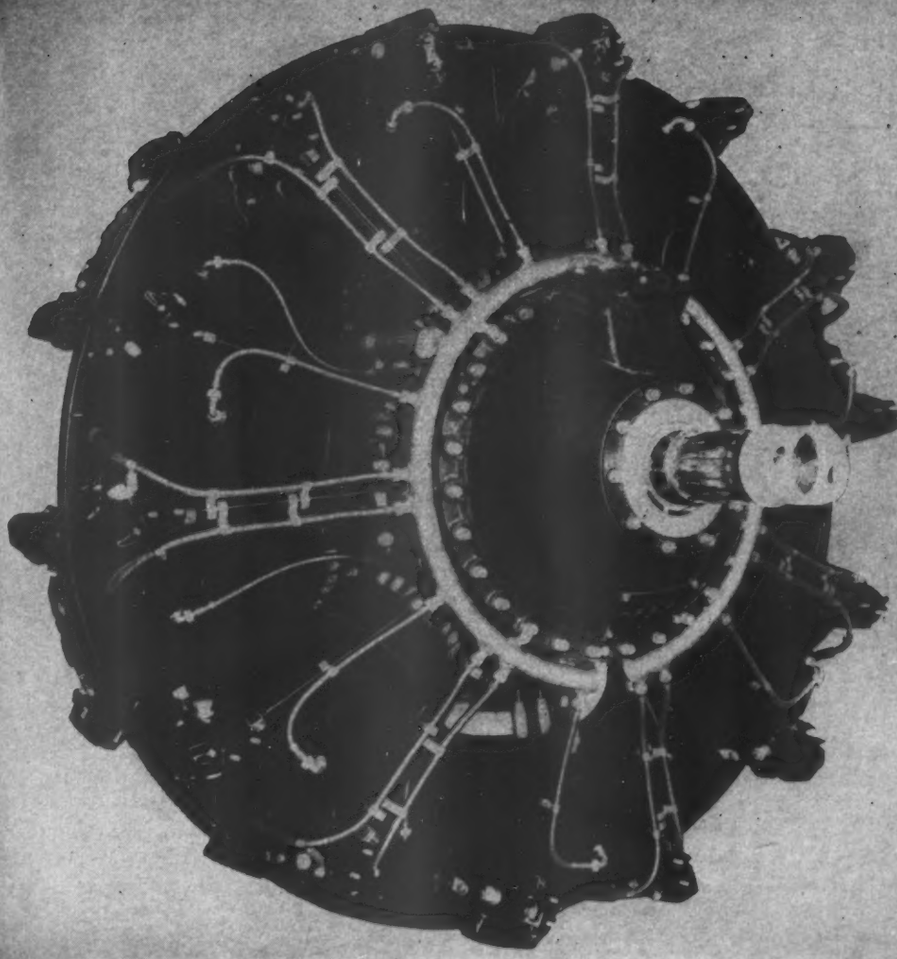
A notable feature of the plane is its retractable landing gear. This is probably the first time a plane in this price class has offered this as standard equipment. The retracting mechanism is hand operated from a wheel in the cockpit, and has both audible and visual warning devices to prevent landing with the wheels up. The wheels, when folded back, fit into wells in the wing which are just outboard of a twenty gallon gas tank in the left wing root, and a three cubic foot luggage compartment in the right wing root.

(*Turn to page* 42)

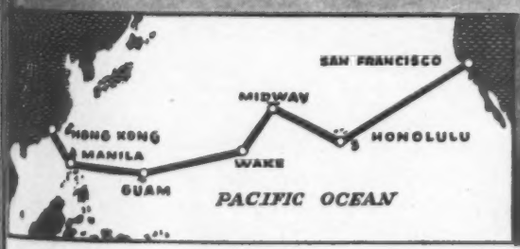


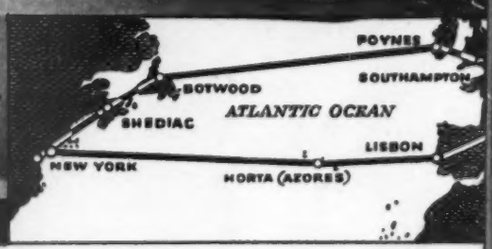
WRIGHT

Double Row CYCLONE 14



Now Available AT 1600 H.P.





The Wright Double-Row Cyclone 14 engine rated at 1600 H.P. is now available for sale throughout the world.

The 1600 H.P. Double-Row Cyclone 14 is the outgrowth of experience gained from the production and operation of over 9,000 single and double-row Cyclones, a background that has made it the world's most powerful aircraft engine now in service operation.

Double-Row Cyclone 14 engines power all of Pan American Airways' 74-passenger Boeing Clippers now in regular service on their trans-Atlantic routes to England and Southern France and their trans-Pacific routes to Honolulu, the Philippines and China. Another outstanding example of commercial aircraft powered by Wright Double-Row Cyclone 14 engines is the new 36-passenger twin-engined Curtiss-Wright Transport.

Further use of the engine is indicated in the large production orders for the Double-Row Cyclone 14 which have recently been placed by the United States Government under its procurement program to expand the Air Forces. These engines are already installed in twin-engined U. S. Navy Patrol Boats and two manufacturers' production models of twin-engined U. S. Army Medium Bombers, and twin-engined Army Attack-Bombers as well as other advanced types of Army and Navy aircraft.

WRIGHT AERONAUTICAL CORPORATION
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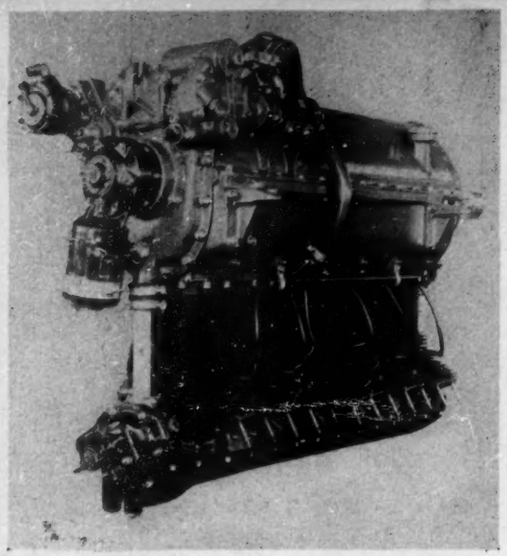
See the Advanced Cyclones Now on Display in The Aviation Building, New York World's Fair

WRIGHT *Aircraft* ENGINES

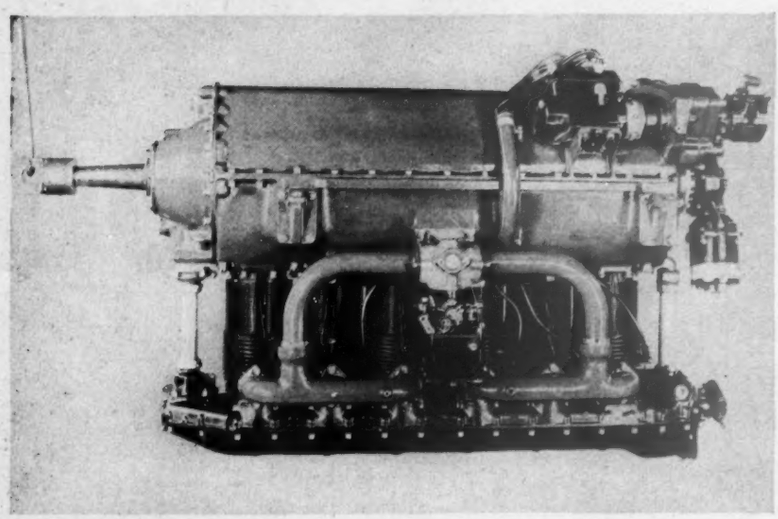


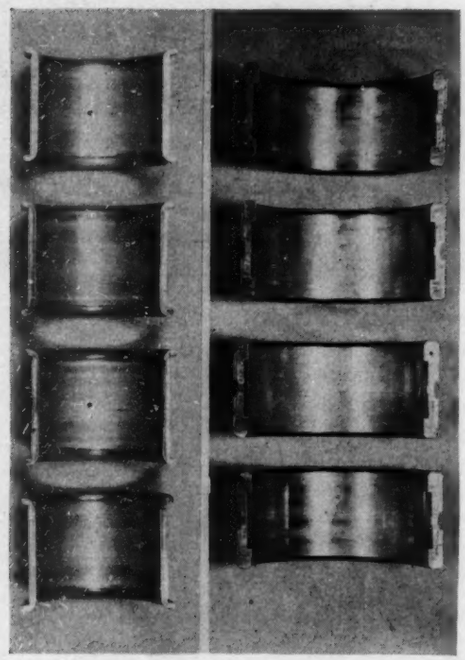
Ranger six-cylinder, in-line aircooled engine which develops 175 hp. on 65 octane fuel.

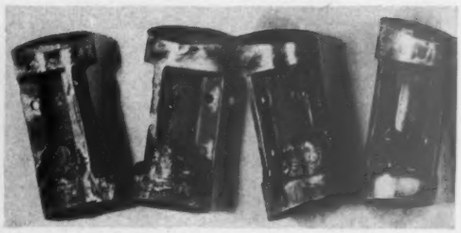
New Ranger Six

Model 6-440C-2 completes 150 hr. type tests

ANNOUNCEMENT of the new Ranger 175 hp., 65 octane, Model 6-440C-2 engine, has been preceded by a military type test consisting of 150 hours of continuous operation. This model was developed to comply with the primary training requirements of the U. S. Army training program, but has been released for export sale under Approved Type Certificate No. 216.







Above, right: Three of the six "sludge plugs" from the crank throws which serve as centrifugal oil cleaners, after test runs. Above: Appearance of typical connecting rod and main bearings after type testing.

The endurance testing required by Army specifications consisted of 150 hours of continuous operation with four brief stops to change oil and propellers. The entire test was conducted without a single adjustment of the engine. Sixty-five hours of the test were run at rated power, with five hours at rated power and 110 per cent of rated speed. Fifty dives, 20 per cent overspeed, and a power calibration were made at the conclusion of the endurance running. The entire program was completed in an elapsed time of 7½ days.

The clearance on one valve changed two-thousandths, and no other valve had a change of more than one-thousandth from the original setting, despite the fact that no inspection or adjustments were made from the beginning of the test to the teardown and inspection following completion of the test program. The Ranger "sludge-plugs," which serve as centrifugal oil cleaners in each of the six crankshaft throws, gave excellent performance during the test. The accompanying photograph shows sludge removed from the "Aero Shell" oil. During normal service, between overhauls, approximately three times this amount of sludge is collected, and removed as a cause of wear on all moving parts in the engine. The increase in sludge collected is largely the result of increase in dustiness of the average airport over the test stand conditions. The oil put up an excellent performance during the test, with a virtual absence of wear on rings and all bearings.

Consistent with Ranger practice, the new engine is in-line, inverted, and aircooled, differing from the familiar Model 6-410B-2A, now currently in production for private-owner airplanes, in the following respects:

Model	Standard 6-410B-2	6-440C-2
HP. (normal rated)	165	175
R.P.M. (normal rated)	2450	2450
Fuel	80 Octane	65 Octane
Bore	4.125 in.	4.125 in.
Stroke	5.125 in.	5.500 in.
Displacement	410 cu. in.	440 cu. in.
Compression ratio	6.5:1	6.0:1
Propeller shaft	S.A.E. No. 1 taper	S.A.E. No. 10 spline or S.A.E. No. 1 taper
Spark advance	30 deg.	22 deg.
Weight	350 lb.	355 lb.

Additional improvements may be summarized as follows:

(1) New "tuned" intake manifolds and a new hotspot are employed in the 6-440C-2, designed to secure a ramming effect by properly utilizing mixture pulsation in the intake manifolds to assist in charging the cylinders. By minor changes in the "tuning" it is possible to obtain within wide limits any desired shape

(*Turn to page* 42)

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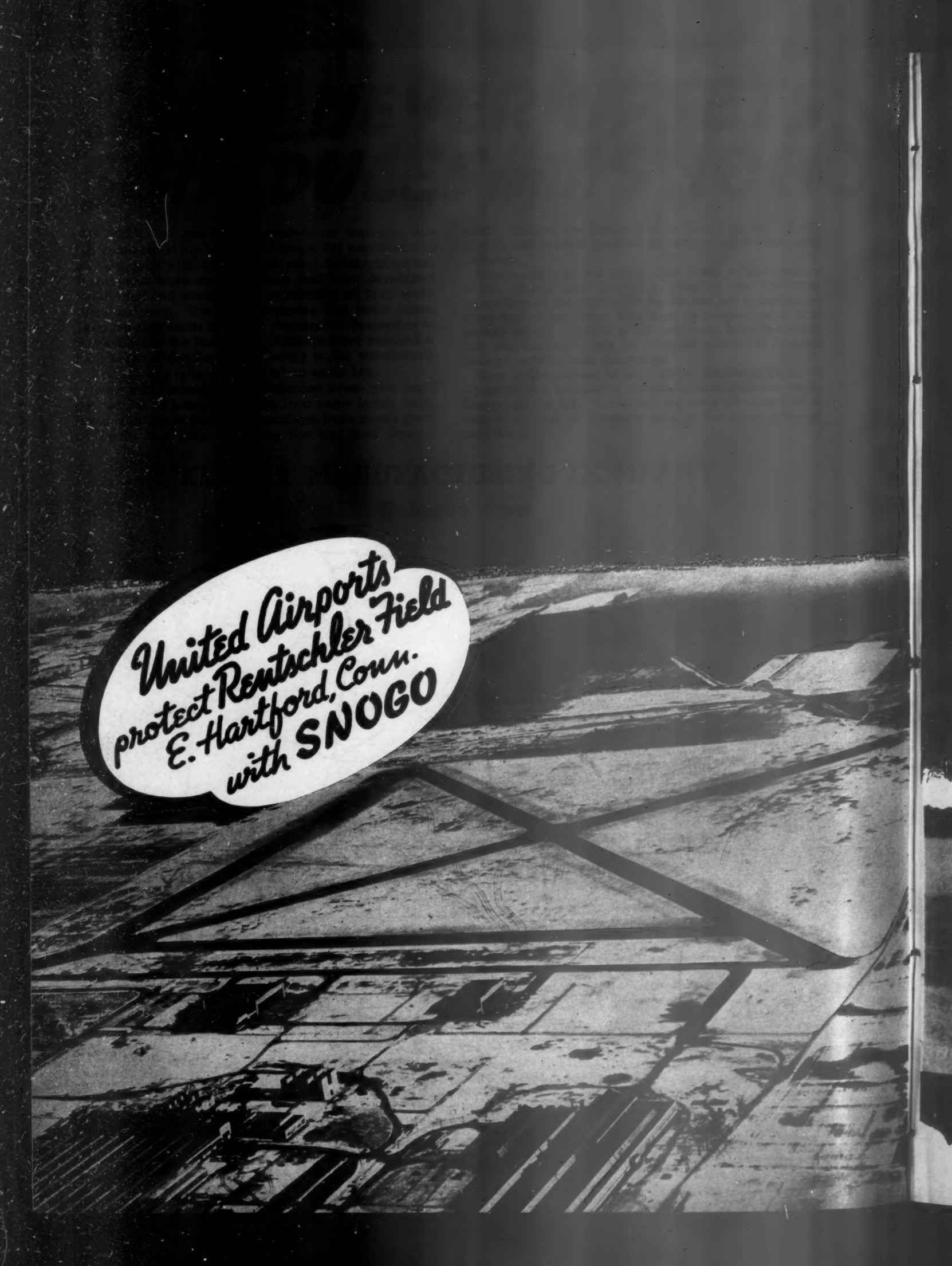
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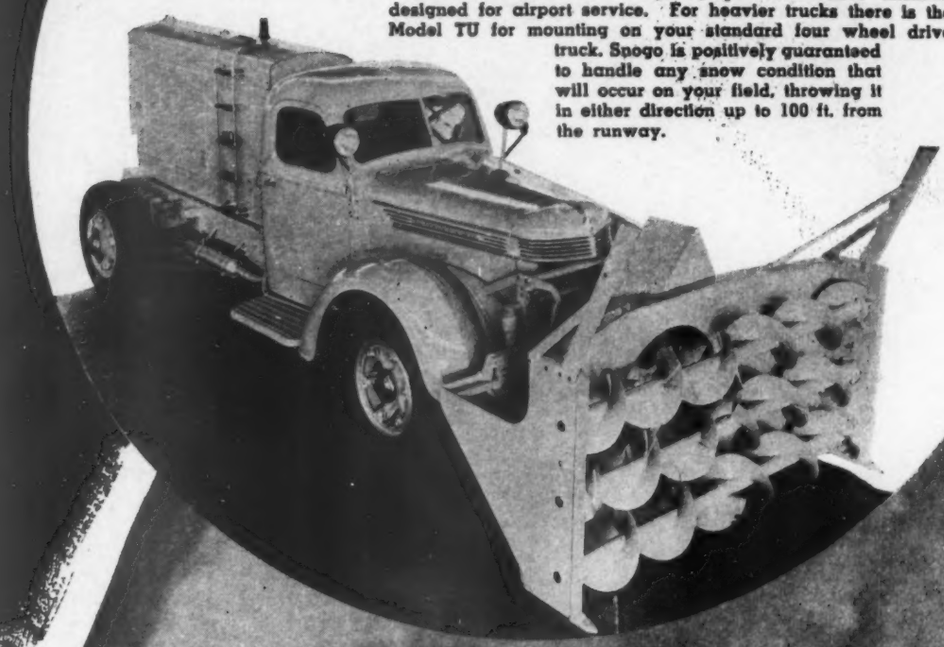
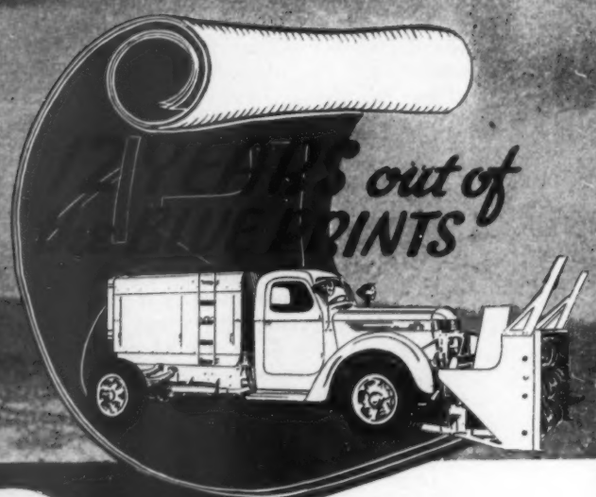
SNOGO Model LMU for Model D-50 Three Ton International Trucks

The Model LMU is a high speed maintenance machine designed for airport service. For heavier trucks there is the Model TU for mounting on your standard four wheel drive truck. Snogo is positively guaranteed to handle any snow condition that will occur on your field, throwing it in either direction up to 100 ft. from the runway.





SNOGO

COMPLETE SNOW REMOVAL

When you purchase a snow remova unit you want a proved machine The first Snogo went into service 1 years ago and was proved basicall sound in principle. Each year, steadi improvement has developed Snog to a point where today it represent

Bellanca 14-9

(*Continued from page 36*)

Red with black trimmings is the standard color scheme of the model 14–9, and after an exhaustive series of test flights which obtained the Civil Aeronautics Authority's approval, the following performance figures have been announced:

Maximum speed at sea level	132 m.p.h.
Cruising speed at 75% power, 3,000 ft. alt.	120 m.p.h.
Initial Rate of Climb	750 ft./min.
Service Ceiling	14,000 ft.
Landing Speed	47 m.p.h.
Range	420 miles

The dimensions, weights and useful loads of the ship are:

Wing span	34 ft. 2 in.
Height over cabin with tail wheel on the ground	6 ft. 3 in.
Overall length	21 ft. 4 in.
Wing Area	140.2 sq. ft.
Weight empty	975 lb.
Useful load:	
Pilot	170 lb.
Gasoline, 20 gal.	120 lb.
Oil, 2 gal.	15 lb.
Two passengers	340 lb.
Baggage & Misc. Equ.	80 lb.
Gross Weight	1,700 lb.
Maximum payload	456 lb.

Ranger Six

(*Continued from page 38*)

of B.M.E.P. curve. This new manifold design results in mild supercharging, without the weight increase, complication and expense of a supercharger. This gives a B.M.E.P. of 131 lb. per sq.in. on 65 octane fuel. Calibration has demonstrated that these manifolds will give 152 B.M.E.P. on 80 octane, without supercharger. This figure is as high as the average for supercharged engines on 87 octane fuel of two or three years ago. The new manifolds also provide exceptionally good distribution, evidenced by the ability to run on the dynamometer at full throttle on 65 octane with a fuel consumption of only .47 lb. per b.h.p. per hr. Standard carburetor setting to give a cruising consumption of .55 lb. per b.h.p. per hr. is provided for service use in military training planes.

(2) Intake valve ports have been redesigned to provide a smooth and more efficient flow of mixture into the cylinder, thereby increasing the volumetric efficiency. This design change is the result of flow tests through the intake ports. The program involved simply a study of feasible shapes of the intake ports to give minimum turbulence, and therefore minimum losses, to the intake mixture with the intake valve in all positions between full open and full closed.

(3) The 6-440C-2 has an increase in stroke of $\frac{1}{8}$ in., bringing the stroke to 5.500 in. The 6-410B-2A has a stroke of 5.125 in.

(4) Each of the two parting surfaces of the 6-440 upper crankcase has a milled slot extending the entire length of the crankcase. A rubber oil seal is located in this slot to eliminate the possibility of oil seepage.

(5) A new camshaft with modified valve timing is employed in the Model 6-440C-2 engine.

(6) The crankshaft of the 6-440C-2 engine is supplied with a No. 10 spline. Other Ranger sixes are provided with S.A.E. No. 1 taper shafts.

(7) Pistons are fitted with three 3/32 in. compression rings and one 3/32 in. bevel scraper ring. Formerly all six-cylinder engines were equipped with $\frac{1}{8}$ in. rings.

(8) The location of the fuel pump drive has been shifted from the upper left hand side of the engine to the rear end of the scavenge pump housing. A vacuum pump drive is now located in the former position of the fuel pump drive.

(9) Chrome-molybdenum cylinder barrels, chrome-molybdenum crankshafts, and austenitic Silcrome exhaust valves comprise the more important material changes incorporated in the new 6-440C-2 engine. Magnesium is now being used for the rear case as well as for the cambox and various small housings.

(10) A change in the design of the babbitt main-bearings has greatly increased their load carrying ability, as well as improving the performance of the cadmium-silver connecting rod bearings, by providing more oil through the crankshaft to the crankpins.

The accompanying photographs indicate that the engine is similar in external appearance to the former 6-410B-2A engine, since but few external changes have been made; however, the company has been informed that the new model does not make a feasible installation in current private-owner airplanes which are powered with the Model 6-410B-2A, and therefore, production of this model will be continued.

1939 Air Races

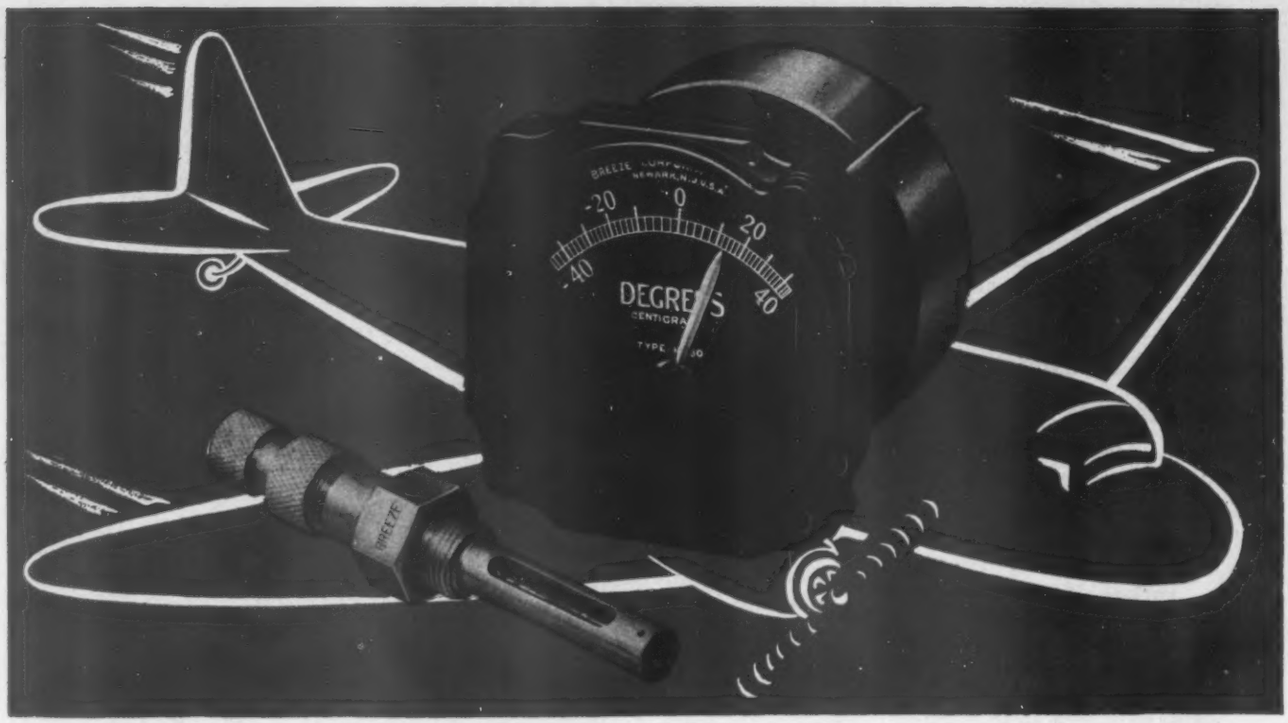
(*Continued from page 25*)

ently active over a period of exactly ten years now. All of Rider's racers have been outstanding performers. The one exception has been the *8-Ball*, a molded plastic-plywood job, which looked liked a winner when introduced last year, but flopped miserably. Since then Keith has had the engine completely rebuilt, has acquired a Hamil-

(*Turn to page 74*)

Luscombe Seaplane

The Luscombe "65" is now approved as a seaplane. Installing the Edo #1320 floats puts the gross weight at 1,260 pounds with a useful load of 469 pounds. Taking off from still water in 15 seconds the Luscombe can climb fully loaded at 700 feet per minute and cruise at 95 miles an hour. The orders for the "65" model have necessitated the Luscombe Company's expanding their manufacturing facilities and tripling their production since May.



BETTER TEMPERATURE CONTROL
with BREEZE Resistance-Type Thermometer

Dependable accuracy . . . faster registering . . . ease of connection into the electrical system of an airplane . . . these are some of the superiorities of the Breeze Resistance-Type Thermometer.

The instrument operates by measuring changes in the conductivity of a heat-sensitive electrical-resistance element, and features these advantages:

The Resistance element is permanently sealed in glass against corrosion and contamination, and is further protected against accidental breakage by air aluminum tube slotted and drilled to permit free circulation of the surrounding liquid or gas.

The temperature-resistance characteristics of the element are permanent and it is not affected by the unaccountable variation found in the old type bulbs.

The indicator is the ratio-meter type which automatically compensates for variations in battery voltage.

For reading carburetor air, "oil in" and "oil out", outside air, cabin and supercharger temperatures and any other point on the aircraft where accurate readings are necessary.

These features make the Breeze Thermometer most efficient in aircraft operation.

BREEZE MARK

Radio Ignition Engine and Auxiliary Shielding • Spark Plug Radio Shieldings • Multiple Circuit Electrical Connectors Flexible Shielding Conduit and Fittings • Conduit Junction Boxes • Cartridge Engine Starters • Dichromate Cartridge Containers •

Internal Tie Rods • Propeller Pitch Controls • Elevator and Rudder Tab Controls • Flexible Shaft and Case Assemblies Aeroflex Jr. Flexible Instrument Lines • Tachometer, Fuel Pump and Remote Control Drives, Etc. • Ammunition Rounds Counters •

Radio Tuning Units • Generator and Ignition Filters • Engine Primers, Single or Multiple • Fuel and Oil Tanks Exhaust Gas Analyzers (Fuel-Air Ratio Indicators) • Flexible Tubing of Stainless Steel, Aluminum, etc. • Resistance Type Thermometers • Swaging Machines and Hand Swaging Tools •

Stainless Steel Division: Pioneers in the design and development of stainless steel structures and fabricated products.

REGULAR CONTRACTORS TO THE U. S. GOVERNMENT

BREEZE CORPORATIONS, INC.

41 SOUTH SIXTH STREET, NEWARK, N. J.

AVIATION RADIO

Dialing the Air Waves with Don Fink

Mobile Landing Equipment

Airtrack adds a marker beacon transmitter mounted on a cycle

A COMPLETELY mobile instrument landing system of particular value for military purposes has been achieved by the Airtrack Manufacturing Corporation. The system, shown in the accompanying photo, consists of three elements, which are moved about as a "train." The truck which leads the procession contains a gasoline generator and supplies power for the glide-path and localizer transmitters. These transmitters are mounted in the main trailer. The antennas for these transmitters are mounted directly on the roof of the trailer.

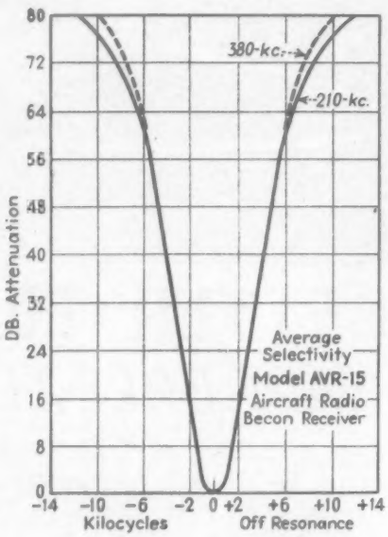
The marker beacon transmitter, with gas-generator power supply and antenna—the whole works in fact—is mounted on a motor tricycle. The horizontal antenna may be kept in place as shown while the motorcycle is in motion, but ordinarily it is removed until the temporary station of the transmitter has been reached.

The military advantage of this equipment is emphasized by its manufacturers. Because of complete mobility, the equipment may leave an established military airport and set-up in a new base field in a matter of hours. The mobility also permits shifting the position of the glide path and its associated marker and localizer according to the demands of the prevailing winds or the topography of the landing area.

Beacon Receiver

RCA's AVR-15 packs lots of performance in a small space

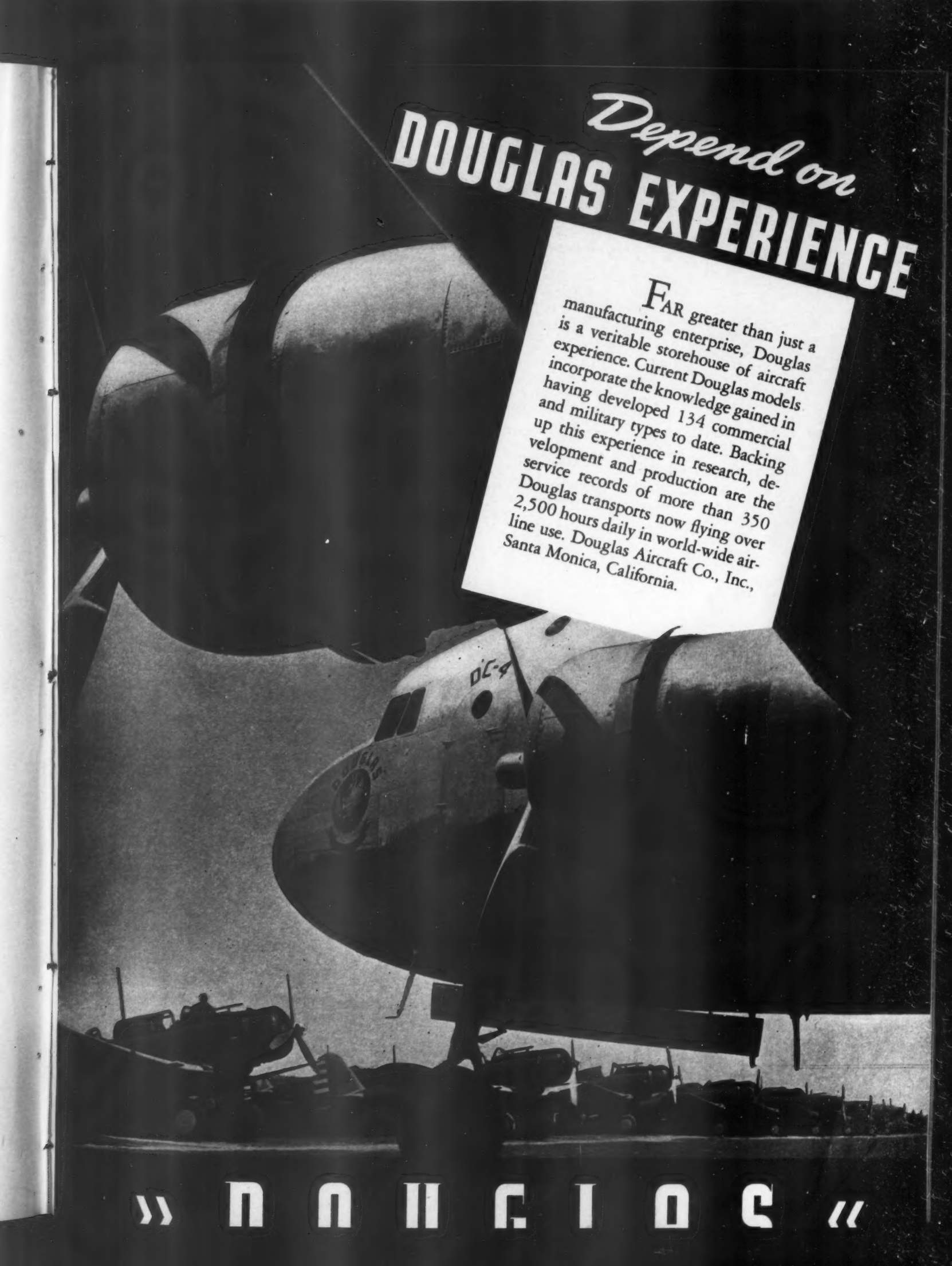
SOME months ago in these columns a brief announcement was made of a new RCA receiver which is intended for installation in light planes, to provide weather, beacon and traffic control information.. Now more complete specifications on this receiver, the AVR-15, have been released, the specs indicate that it is quite a job, despite its small size and light weight. Three six-volt tubes are used, two 6K7's and a 6K8, in a dual-oscillator-channel superhet circuit. The B supply, obtained either from a vibrator power supply or from batteries, 25 ma. If the matching power supply (Type AVR 51) is used, the drain for all power functions is 1.75 amps at 12 volts, or 25 amps at 6 volts. Adjustable antenna coupling circuits are provided, and the maximum output is in the neighborhood of 300 milliwatts into 600 ohm phones, more volume than you or I would care to have clamped to our heads. The price without power supply is $99.50; with it, $34.00 extra.



Selectivity of AVR-15

The tuning arrangements are simple. The main tuning dial covers the range from 200 to 410 kc, and dial has been chosen for easy manipulation with gloved hands, a great boon in open craft. For quick transfer to the con-

Pick-a-back blind landing system, developed by Air-Track, uses a marker beacon transmitter, complete with power supply, on a motor tricycle (above). Below, the complete train.


Depend on
DOUGLAS EXPERIENCE
FAR greater than just a manufacturing enterprise, Douglas is a veritable storehouse of aircraft experience. Current Douglas models incorporate the knowledge gained in having developed 134 commercial and military types to date. Backing up this experience in research, development and production are the service records of more than 350 Douglas transports now flying over 2,500 hours daily in world-wide airline use. Douglas Aircraft Co., Inc., Santa Monica, California.
DC-4
DOUGLAS

trol tower trequency of 278 kc a large toggle switch is provided on the front panel, which, when thrown to the traffic control frequency, automatically disconnects the variable tuning system. The selectivity curve, illustrated herewith shows a band-width of only slightly greater than 4 kc at 20 db attenuation (ten times down). This narrow selectivity band permits a considerable degree of selection between voice and range transmission on the simultaneous beacon broadcasts. The receiver and its accessory equipment (power supply, antenna transformer) bear CAATC approval certificates.

New Genemotor

Carter Announces Heavy-duty Power Supply for Aircraft Use

THE CARTER MOTOR CO., Chicago has announced a new line of heavy-duty genemotors suitable for aircraft radio and similar purposes. Among the features of the new unit are self-oiling bearings, silk insulated armature wire, mica-insulated commutator, hard carbon brushes, ventilated frame, and full conductor sizes and insulation for operation under continuous duty. List prices range from $27.50 to $60 exclusive of filter, while filters intended for use with these units can be obtained from $12 to $18. The 12-volt series, especially adapted to aircraft work, are manufactured in d.c. output voltage ratings from 300 to 750 volts, with milliampere drain from 125 to 300 volts (not corresponding ratings). These units weigh 9 lb. 8 oz. without filter in the smaller sizes and 12 lb. in the larger sizes. The filters weigh 4 lb. each. Special windings for 12 or 24 volts input are also available. Dual units having twice the rating of the single units are also available. They weigh 18 lb. and require a filter weighing 6 lb.

For genemotors having an input drain of 10 amp. or higher, a remote control starting relay is recommended. This same relay can be supplied with a break-contact for cutting off the receiver power supply when the transmitter unit is on.

Transfer

Schuttig New Chief Engineer at Siebenthaler Manufacturing Company

WE HAVE RECEIVED an announcement of the appointment of L. A. Schuttig as chief engineer of the Thomas L. Siebenthaler Manufacturing Company. Kansas City. Mr. Shuttig, formerly in charge of the radio development projects at the Bendix Radio Corporation, will direct the design of u-h-f and standard aircraft radio equipment for the Siebenthaler company, as well as the development of de-icing devices and service equipment manufactured by that firm.

Radio-controlled model plane (shown with wing removed) developed by Joseph Raspante (right) was scheduled for demonstration at Detroit International Meet

WINDOW SHOPPING

THE following catalogs of interest to the aviation trade have recently been made available and may be obtained without charge (unless otherwise indicated) by writing to the manufacturer listed:

AERIAL PRECISION CAMERA—An 8-page illustrated catalog describing the latest air mapping camera equipment offered by Mark Hurd Air Mapping Corp., Minneapolis, Minn.

CECO AIRCRAFT CARBURETORS—Complete descriptive manual Chandler-Evans Corporation, 2200 Eighth Street, Detroit, U. S. A.

GOODRICH PRODUCTS FOR 1939—A fascinating illustrated booklet showing all the latest uses for rubber. Goodrich Tire & Rubber Co., Akron, Ohio.

MAGALLOY THE WONDER METAL—A 16-page wire bound manual liberally illustrated and generously supplied with data dealing with applications of magnesium alloys to various products and problems. Magnesium Fabricators, Division of Bohn Aluminum and Brass Corp., Adrian, Mich.

MAGNUS No. 78—A descriptive folder dealing with Magnus chemical used in cold-water cleaning of engine parts. Magnus Chemical Company, Inc., Garwood, N. J.

MODERN ENGINEERING—A presentation of the latest developments in Niagara equipment. Niagara Machine & Tool Works, Buffalo, N. Y.

NIAGARA POWER SQUARING SHEARS—Bulletin BL—Catalog describing series BL shears having a capacity up to 10 gage.

PHEOLL PHILLIPS RECESSED HEAD SCREWS AND BOLTS—A 4-page folder showing graphically the advantages and applications of the recessed head type screw. Pheoll Manufacturing Company, 5700 Roosevelt Road, Chicago, Ill.

SCHERR CATALOG FOR 1939—Describes the complete line of machine tools, instruments, and machinery handled by this organization, including all types of mechanic's tools, optical inspection tools, and other special inspection tools. George Scherr Company, 128 Lafayette St., New York, N. Y.

Again

SKF Responds TO INDUSTRY'S NEED!

New—A DOUBLE FELT SEAL BEARING MADE TO STANDARD SINGLE ROW WIDTHS

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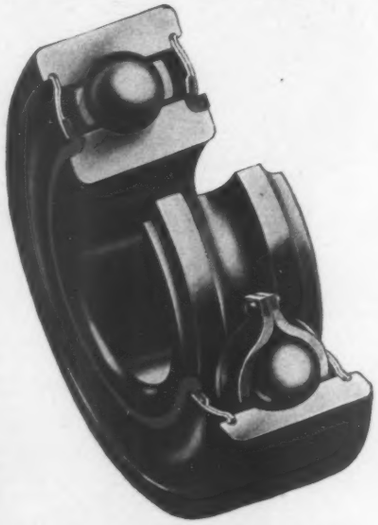
SKF
RED SEAL BEARINGS



THE STOP SIGNAL FOR DIRT
Patent Applied For

1. Made to standard single row SAE dimensions with races flush on both sides.
2. Assures perfect sealing and retention of grease over great range of speeds.
3. Provides for large area of felt fibre contact, yet within the standard width.
4. Frictional drag is kept at a minimum, sealing by felt fibre contact on polished grooves instead of by compression.
5. Sealing ability is constant. Will not glaze. The resiliency of felt provides automatic correction for wear.
6. Provides the same lubricant space as in most off-standard bearings.
7. Simplifies design because of standard dimensions, saves space.

4388

SKF RED SEAL BEARINGS

SKF INDUSTRIES, INC., FRONT STREET & ERIE AVE., PHILADELPHIA, PA.

BUYER'S LOG BOOK

What's New in Accessories, Materials, Supplies, and Equipment

Although just about the oldest of all navigation instruments, the magnetic compass has been subjected to astonishing improvement in recent months. Typical of such progress is the new Type 488B Direction Indicator announced by the Kollsman Instrument Company. Unlike all previous compasses of this type, a moving pointer continuously indicates direction against a fixed dial. Not only does this eliminate setting of the verge ring for each course, but it permits the observer to know instantly the heading of the airplane if he inadvertently deviates from the correct course. Parallel reference lines and index may be set to facilitate compass readings over extended periods of time. By using a fixed dial reference to a map is made easy because the dial layout corresponds exactly to that of the compass rose on the map. Parallax is completely eliminated.——AVIATION, *September, 1939.*

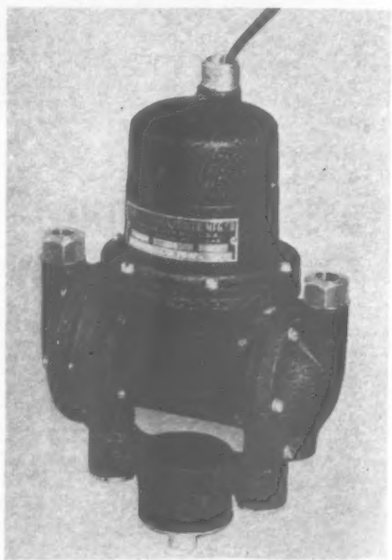
Kollsman Direction Indicator

Working in conjunction with the propeller manufacturers, airline engineers, and military services, an advanced type De-Icer Propeller Spinner has been developed by the Thos. L. Siebenthaler Mfg. Co. of Kansas City, Mo. By means of an ingenious system of shock absorbing mountings the Siebenthaler spinner gives a service life of several thousand hours instead of the customary 100 hours of service for the conventional propeller spinner. The Siebenthaler spinner is self-centering, provides total enclosure for the hub, and may be removed without removing propeller.——AVIATION, *September, 1939.*

Siebenthaler De-Icer Spinner

A complete new series of lightweight, aircraft type electric generating plants has been announced by D. W. Onan & Sons, Minneapolis, Minn. The various models range from 1000 to 7500 watts output, with various voltages and 50 to 800 cycle alternating or direct current. The units are standardized in construction and a series of 21 different types of generators can be supplied on each of the three models. Power on all three models is supplied by two cylinder opposed four cycle air-cooled gasoline engines equipped with high tension magnetos, fuel pumps and automatic chokes. Weight range is from 70 to 175 lbs. for the three models offered. These units have been designed for use on aircraft in flight, or as emergency equipment or for power supply in remote regions for the operation of electrical systems and devices.——AVIATION, *September, 1939.*

Major problem of de-icing systems, has been to develop a satisfactory pump to handle the small quantities of de-icing fluid required for such items as propellers. The Siebenthaler De-Icer fluid pump, developed by the Thos. L. Siebenthaler Mfg. Co., of Kansas City, a subsidiary of Aircraft Accessories Corp. of Glendale, Calif., has been widely tested in airline use. The pump is of double diaphragm type, one pump supplying both propellers on a twin-engine plane. The pump has a lift of 53 in. from dry and has a max. capacity of 14,904 CC per hour. Inlet and valves are readily accessible for cleaning without dismantling the pump. The pump is driven by an electric motor with rheostat control, both of which are completely radio shielded. The motor may be supplied in 6, 12, or 24 volts, and has a current consumption of one ampere.——AVIATION, *September, 1939.*



Siebenthaler De-Icer fluid pump.

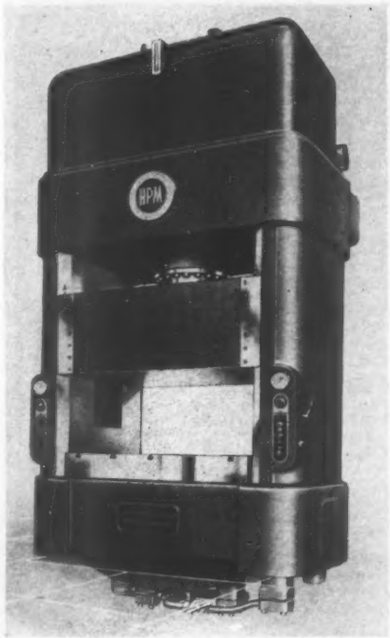
Increasing extension of aerial photography into map making fields of many kinds has brought intensive development of aerial map making equipment. A new precision camera designed primarily for map making and incorporating many original features is now in production by the Mark Hurd Air Mapping Corporation, Minneapolis, Minn. The Mark Hurd camera and mount make up a complete unit and are relatively compact and light in weight. All essential instruments, such as two-way level, stop watch, and counters, are located in a tray on top of the camera directly in line with the operator's normal vision. Film containers of unusual design speed up loading and unloading in flight. A quick, removable gear box contains most of the operating mechanism. The lenses too are interchangeable. The camera carries 180 ft. of film and has a negative size of 9x9 in.——AVIATION, *September, 1939.*

Siebenthaler Constant Speed control unit.

In order to test the constant speed control unit of the Hamilton-Standard constant speed propeller with the precision required by the manufacturer a complete test unit has been perfected by the Thos. L. Siebenthaler Mfg. Co. of Kansas City, Mo. The constant speed control mounts on the instrument panel of the test unit in the same manner as it is mounted on the engine, and is driven by a 1½ h.p. variable speed motor controlled from the panel. A suitable tachometer registers the speed of the motor while a pressure gauge shows the back pressure on the pump. An electric clock reads in seconds to determine volume output of the pump. This unit is also used to set the control for pitch against predetermined r.p.m.——AVIATION, *September, 1939.*

No better example of the industry's growth could be adduced than the frequency with which new power presses are pressed on the trade by press builders. Latest is a new H-P-M "Smooth-Line" FASTRAVERSE double-action press by the Hydraulic Press Manufacturing Company, Mount Gilead, Ohio. This press has two separate hydraulic pressing members, the main slide, and the die cushion platen located underneath the bolster plate. A fast closing and opening speed, without shock, is accomplished by the patented FASTRAVERSE system.——AVIATION, *September, 1939.*

Many useful properties around aircraft are claimed for a new plastic material known as Monocork and offered by the Armstrong Cork Company, Lancaster, Penna. Monocork is a plastic material consisting of liquid rubber, a dehydrating power and cork granules. The product is mixed on the job and takes an initial set in from 8 to 12 hours, with a final set in from 24 to 48 hours. It is said to be an ideal material for streamlining around struts and other exposed parts, it makes a desirable flooring for airplane cabins, and it is an excellent material for covering control pedals or for wing walk-ways, as it is non-slip, wet or dry.——AVIATION, *September, 1939.*



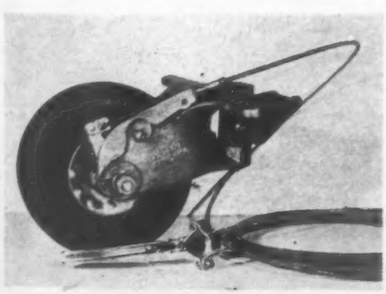
Smoothline Fastraverse Press by H-P-M.

Spot welders and other resistance welding equipment specifically designed to meet the needs of the aircraft industry in welding aluminum alloys, and stainless steel parts, has been developed and marketed by the Acme Electric Welder Company, of Huntington Park, Calif.——AVIATION, *September, 1939.*

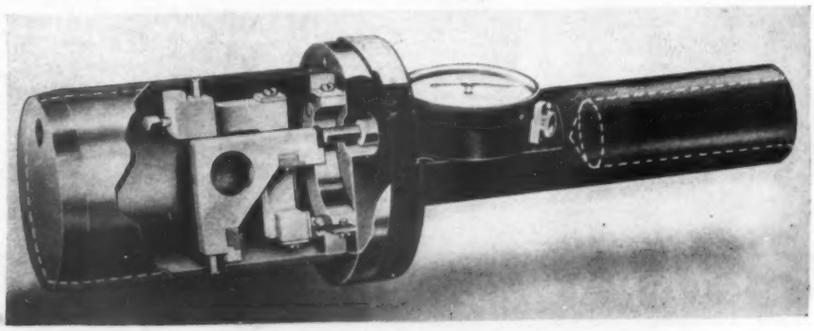
A new tail wheel brake assembly has recently been developed by the Aeronautical Trading Co. of Brooklyn, N. Y., built mainly for use in the light plane field. The unit consists of a steerable tail wheel with a brake attached, all of which can be operated within a 180 degree radius. The outstanding feature in this assembly is the New Departure brake that is operated from the cockpit through a 20 ft. flexible cable. By the pilot's seat is a lever which when pressed can give either a sudden or slow stopping effect. The wheel itself uses a center solid tire, size 6 x 2, and any standard make tire can be used. The complete unit weighs approximately 4 lb. and can be installed on any light plane having a spring leaf tail skid.

A high precision plug gage developed specifically for checking cylinder bores while set up on the finishing machine, or on final inspection, has been perfected by the Sheffield Gage Corp., of Dayton, Ohio. The gage can be read to tenths and interpolated to fractions of tenths. It carries two gaging points diametrically opposite each other and instantly indicates any irregularity on either side of the bore. Any condition of bell-mouth, taper, sags or ridges are immediately apparent on the dial scale.——AVIATION, *September, 1939.*

(*Please turn to page 78*)



A.T.C. Tail Wheel Brake

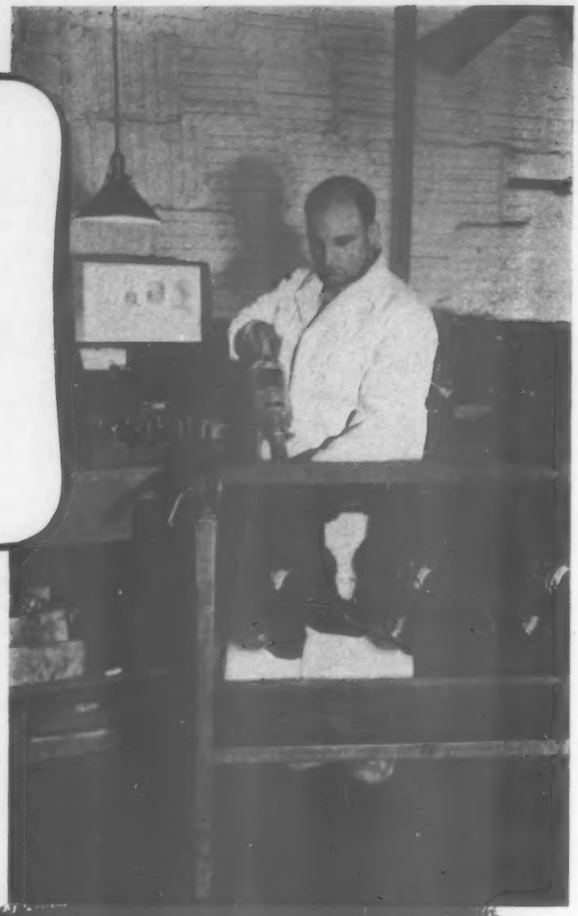


New Sheffield plug gage.

NO VALVE TROUBLE

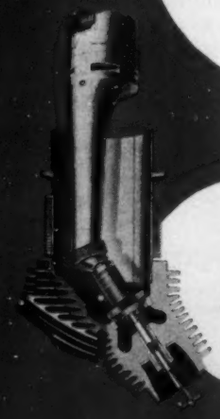
for Boston & Maine—Central Vermont Airways

thanks to **SIOUX AIRCRAFT TOOLS**



Mr. C. M. Belinn, Supt. of Engineering, reports, "During 6 years of operation over densely populated New England necessitating high percentage of full throttle take-offs, no valve or valve seat trouble has been experienced, due in great part to our precision SIOUX Valve and Valve-seat reconditioning equipment."

SIOUX VALVE FACE GRINDING MACHINE
WET GRINDER No. 662 produces smoother jobs . . . does precision work easily and quickly—with minimum wheel dressing. It wet grinds all valves up to 6" diameter, any angle, including 90° flat valves. Grinding head easily adjusted for large or small valves. It wet grinds valve tappets and rocker arms to original efficiency. Comes complete with diamond dressers, reamer sharpening and rocker arm grinding attachments, ½ h.p. motor, etc. Chucking capacity 9/32" to 13/16".



SIOUX AIRCRAFT DUAL ACTION . . . . . .
VALVE SEAT GRINDER Accuracy with speed in refacing aircraft valve seats—either cast, hardened steel, bronze or stellite. The driving spindle is adjustable, Universal motor operates on AC or DC. Net weight 8½ lbs.

WRITE FOR FULL INFORMATION

STANDARD THE WORLD OVER

ALBERTSON & CO. INC., SIOUX CITY, IOWA, U.S.A.

THE AVIATION NEWS

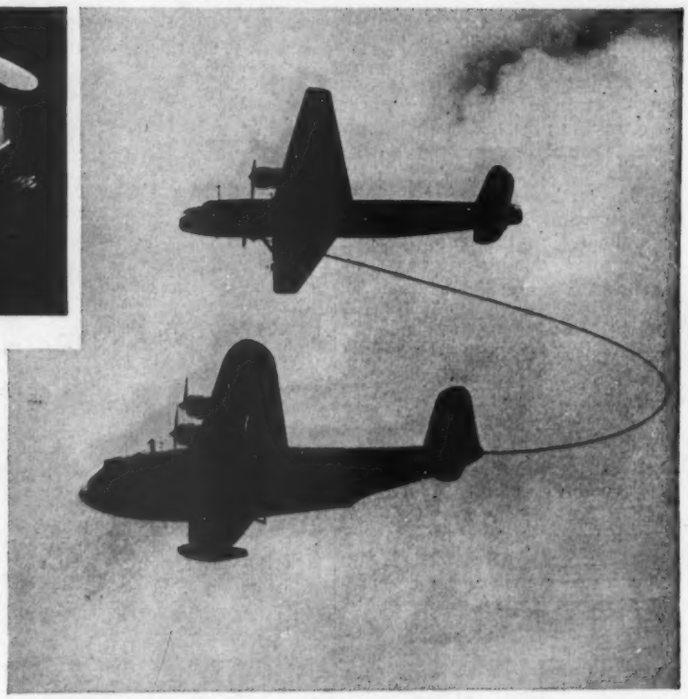
REVIEW, COMMENT, FORECAST

DANIEL SAYRE
C. F. McReynolds, *Pacific Coast*
Blaine Stubblefield, *Washington*
E. R. Lockin, *New York*

SEPTEMBER 1939

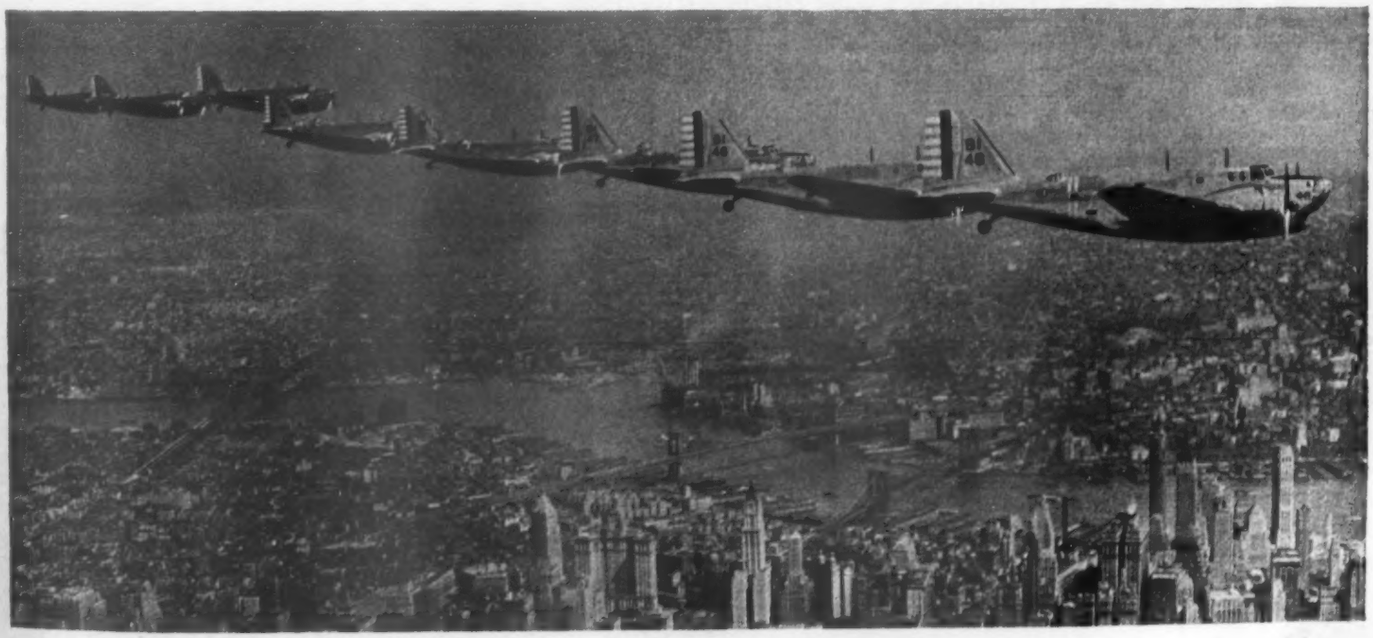
New Millions for Air Defense

(Story on page 52)



TRICK OF THE MONTH: Imperial Airways has adopted the "feeder system" for refueling their America-bent mail ships. This is part of their plan for flying the Atlantic via the northern route through Newfoundland. ABOVE—The crew of the "Caribou" read a London paper in New York after their inaugural crossing. Left to right: Capt. S. G. Long, Chief Officer; B. C. Frost, First Officer; Commander J. C. Kelly Rogers; Radio Officer C. E. Wilcockson, and Senior Radio Officer A. J. Coster. RIGHT—The "Cabot" gives the new refueling system a test.

PARADE OF THE MONTH: Below—B18's from Mitchell Field line up over New York celebrating the Air Corps' 30th anniversary Aug. 2.



NATIONAL AVIATION

Air Corps In Biggest Spending Splurge

Orders total $85,978,000 in record contract shower.

There was heavy firing along the aviation front Aug. 10, as the War Department reared back and placed the largest single order for war equipment in United States history. Bang! went $85,978,000 of funds made available for new aircraft and equipment by the recently adjourned Congress. Boom! went the country's airplane manufacturing industry as it received in a single day more orders for aircraft than it had ever turned out in any entire year prior to 1937.

The emphasis of the day's procurement was definitely on the heavy "battle-wagon" type of plane. Boeing aircraft got orders for $8,090,000 worth of flying fortresses. Consolidated Aircraft took orders for $8,485,000 worth of similar 4-engine craft. Furthermore "options" for additional planes in this category amounting to $5,400,000 were written into the above contracts. Glenn Martin got the biggest order of all, $15,815,000 for a fleet of its new twin-engined bombers. North American got an order for $11,771,000 worth of its twin-engined bombing planes. Thus a total of $41,076,000 went to strengthen our bombing squadrons. Last April Consolidated got an order for $2,280,000 worth of 4-engined bombers. Douglas contracted to deliver $15,000,000 worth of twin-engined bombers. And Martin and Stearman each undertook orders for a half million for ships of that type. Total current orders for bombers of all classes therefore add up to the very substantial figure of $59,356,000.

Among the Aug. 10 orders, North American also received a $1,326,000 award for advanced training planes and a $2,707,000 contract for basic training planes. The Vultee division of the Aviation Manufacturing Corp. also got an order for $2,489,000 worth of basic training planes.

Lockheed, which on April 26 received a $2,180,728 contract for twin-engined pursuits, last month got a second order for an additional $4,845,000 worth of the same ships.

Stearman received an order for $688,000 worth of basic training planes with provision that the Army might contract at a later date for an additional 2 million dollars worth.

The engine firms likewise came in for big orders. Pratt & Whitney received contracts for $12,320,000. The Wright Company got orders for $7,000,000 worth. Allison received further contracts for $2,375,000 to add to its spectacular 15 million dollar order placed June 29. Lycoming got an order for $270,000.

The War Department announced that its Aug. 10 awards represented "the major portion" of the aircraft purchases it intends to make this fiscal year under the recent air corps Expansion Act. But "additional types are under evaluation at Wright Field, in Dayton and awards will be announced shortly," the Department added. No further details were given but the additional types under consideration were known to be largely single pursuits and the amount involved somewhere between $12,000,000 and $18,000,000.

Wide World

LOUIS JOHNSON
Bang! Went $85,978,000

Just for the general interest in the thing, here is a summation of all Air Corps and Navy orders for planes and engines placed since April 3, the date of the act authorizing the Air Corps expansion program. It lists in order of magnitude the total orders placed with each airplane company.

North American $19,809,218; Douglas $15,000,000; Martin $16,315,000; Curtiss - Wright (Airplane Division) $13,990,209; Consolidated $11,365,000; Boeing $8,778,000; Lockhead $7,025,728; Vultee $3,076,000; Stinson $1,500,000; Beech $1,185,849; Bell $1,073,445; Seversky $974,325; Stearman $500,000; Ryan $152,655; St. Louis $150,002; Waco $100,720; Bellanca $50,000.

Engine contracts awarded during the period by the Army total: Allison $17,355,262; Pratt & Whitney $13,437,872; Wright $7,000,000; Lycoming $270,000.

New Base For NACA

Site Probably at Sunnyvale

As Congress rushed toward adjournment on Aug. 5, it put through—not without a great deal of pulling and hauling between the two houses—the Third Deficiency Appropriation Act. One item of major importance in it was an appropriation of $5,674,000 for the CAA College Training Program (CAA pages 54 and 58). Another was final approval of a second research center for the National Advisory Committee for Aeronautics.

As has been reported on these pages from time to time, the Congressional battle over this vital piece of legisation has been long and complicated. Naturally, with approximately $10,000,000 to be invested in plant and a substantial payroll promised practically in perpetuity in connection with such a base, many a Congressman sought to have the base allocated to his home territory. Early drives for the base were directly blocked by the influence of Virginia's Congressmen and Senators who feared it might detract from the Langley Field Bases' importance and income. The present act has finally passed, sidestepped the allocation of the new center, leaving it up to the discretion of the NACA itself. Since all testimony on the project by NACA authorities has been overwhelmingly in favor of a West Coast site in general, and a location at Sunnyvale, Cal., in particular, it seems an almost absolute certainty that the new research center will be located at that place. The Deficiency Act carried an immediate cash item of $1,890,980 for the construction of additional laboratories, facilities, plus an authorization for the NACA to contract obligations of $10,000,000 for that purpose.

It is a distinct pleasure for us to report the final success of this project which has to the entire aeronautical industry seemed of such basic and fundamental importance. Its final enactment can well be credited to the backing which the industry, the Aeronautical Chamber of Commerce, the Army Air Corps, and the Navy's Bureau of Aeronautics were able to muster in its support. The well-planned "tour of inspection", carried out by Colonel Lindbergh, of the nation's research facilities, and his subsequent testimony before a Congressional committee, deserves front rank mention.

F.D.R. Adds Law Experts

The President has approved the appointment of the following persons as additional members of the American Section of the International Technical Committee of Aerial Legal Experts: Samuel E. Gates, Chief of the International Division, Civil Aeronautics Authority; Arnold W. Knauth, Specialist in Air Law; Dr. Arthur L. Lebel, Aviation Section, Division of International Communications; Edward C. Sweeney, International Division, Civil Aeronautics Authority.

Previous to these appointments the American Section's members were: Stephen Latchford, Chief of the Aviation Section, Division of International Communications; Fred D. Fagg, Jr., Dean of the School of Commerce, Northwestern University; Dr. Dennis Mulligan, Specialist in Air Law.

"70,000 Pilots By 1941"

Hinckley forecasts big gains as he reviews first C. A. A. year.

On Aug. 8, 1938, six men gathered in the reception room of Secretary Roper's office in the big commerce building in Washington to be sworn in as members and administrator of the newly created Civil Aeronautics Authority. Last month, Robert H. Hinckley, now Chairman of the Authority, observed the first anniversary of that event by issuing a review of the Authority's first twelve months of work. Below are

some of the most outstanding passages in his summary:

"On this first anniversary I think that my colleagues on the Authority, the Administrator, and the Air Safety Board can look with a good deal of satisfaction upon what has been accomplished, particularly in view of the indubitable fact that during the last six months activities in all phases of aviation have increased enormously beyond anything we could have reasonably contemplated when we began our task.

"Just to indicate what this growth has been, the scheduled air lines in the month of June carried 164,578 passengers, 64¼ per cent more than June a year ago. During the first six months of 1939, 1,627 airplanes were produced for domestic civil use in the United States, only about 40 of them going to the airlines, the rest being purchased and used by private and non-scheduled flyers. Compared to the first six months of 1938, when 850 civil airplanes were made and sold for domestic use, an increase of over 90 per cent in production and sales.

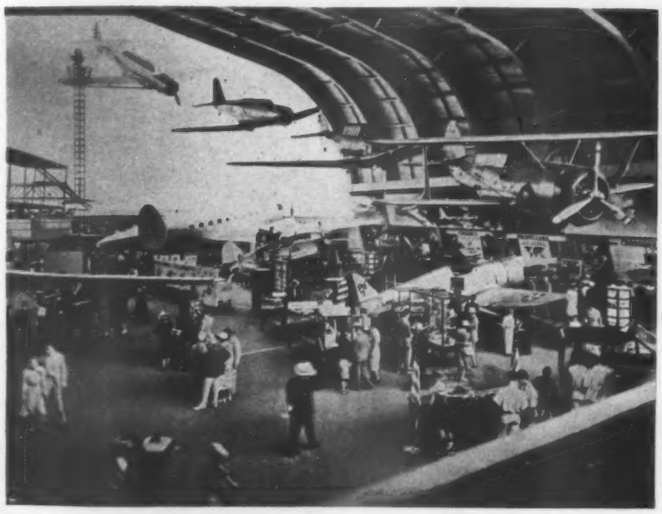
"Today 26,144 pilots hold certificates, 6,000 more than a year ago, an increase of about 30 per cent. There are 11,160 certificated airplanes today, 1,400 more than a year ago or an increase of almost 15 per cent, an increase that will be moved startlingly upward by the production figures of the first six months if they are maintained on an annual basis.

"The increase in pilots according to every indication of our charts will be even more startling. Even without the Authority's own pilot training program, the curves show that there would be 36,000 certificated pilots by the end of 1940, and 43,000 by the end of 1941. Taking into account the student pilot training program, however, the number of pilot certificates in force by the end of 1941 ought to approximate 70,000 of all classes. It is easy to foresee what this tripling of the number of flyers in three years will mean in demand for increased airport facilities, increased manufacturing capacity, and increased use of the federal airways and of the aids to navigation.

"The federal airways within the United States have been increased by about 10 per cent in length to a total now over 25,000 miles. The aids to navigation along these airways have been increased by about the same amount. But that is not as good a measure of their increased usefulness as is the almost complete modernization of existing radio and other aids and the plans now under development for their possible conversion into the new ultra-high frequency category, where they will become even more useful.

"Perhaps no occurrence within this year is of more importance to the United States than the extension of our foreign lines across the North Atlantic, where for the first time, under the American flag, airplanes are flying regularly twice a week between here and Europe. Plans have been proposed for the further extension of our lines in the east to New Zealand. Our flag now flies in the air from Nome, Alaska, to Buenos Aires in the Argentine, and from Hong Kong, China, to Marseilles in France.

(*Turn to page 55*)



MEET ME AT THE AVIATION BUILDING: The air part of the New York World's Fair remains one of the biggest hits. Aug. 19 was Aviation Day, helped put over a near record weekend.

THE WASHINGTON WINDSOCK

by BLAINE STUBBLEFIELD

Congress Says, "No", on No Bidding

Congress slapped army down, not once but twice, about airplane procurement. Army, encouraged by getting the right to negotiate outside the bidding system for "educational orders" and again for aircraft instruments, reached for something really big: power to negotiate for aircraft under the huge expansion program. The curbstone story is that the Administration, which to save face cracked down on Maj. Gen. Benjamin D. Foulois, following the air mail cancellation, charging him with negotiating over the bid fence, was unwilling to reverse itself and cry for exactly what it so lately condemned. Then, when Army called for the right to accept second and third bidders, Congress simply walked out of the heatwave, leaving the bill in a pigeon hole. Don't believe that Army and Military Committee didn't know they had a "second and third" bidder clause in the Air Corps Act of 1926. They just didn't talk about it. This whole controversy will bob up at the slightest war cry.

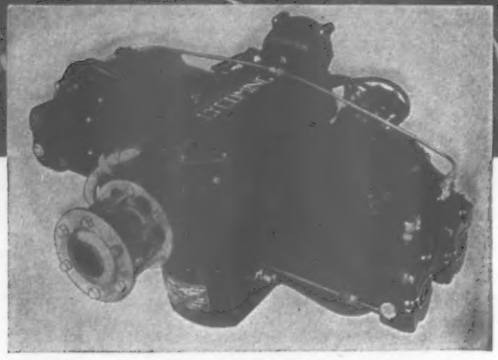
CAA'S First Birthday ended a year of safety performance unequaled unless you look back to times when air transport was mostly mail. It was a happy occasion, and one of which we hope to see "many returns," plus improvement. This good record is due to (1) more cautious schedules mutually agreed to under umpireship of CAA; (2) to constructive safety thinking since delivery from the political curse; (3) the prospect of profits releasing money for safety.

You'll never know just what Kanucks and the Yankees air officials talked about last month in their aviation powwow—unless you're inside with a participant. One thing certainly, was general trading in overland air rights. A possibility was further coordination of airway aids just in case the U. S. Air Corps wanted to get North quick in foul weather. Maybe something about Alaska and Japan. This country and Canada could swap horses and be done with it, except for Britain, which is holding out for a squat at Pearl Harbor to finish the Imperial globe circle.

How about that $2,000,000? Many a moon has waned since United Air Lines' suit for something over that amount in alleged damages resulting from the air mail cancellation was heard by the Court of Claims. Maybe it's treason or something but people who know everything tell us somebody is sitting on that case, because it will go in United's favor, thus confirming the popular opinion that FDR and Farley made a dreadful mistake, which is not nice to talk about with an election coming on.

Spare Parts: NACA got a basket full of letters from people who wanted the $10,000,000 lab in their home town. . . . CAA held its second press conference in a year; Mr. Noble held the first; whatever became of him? . . . You'll never hear the last word about feeder air lines till the towns and villages get 'em; the PO-Du Pont pick-up-and-drop system seems to be working ok; wonder if it will pay its way in stamps. . . . CAA laid off panhandling Congress for airport expansion to make sure of a good handout for pilot training, then came within a gnat's whisker of losing both. . . . Imperial Airways ordered passengers off some of its lines not entirely for reasons stated, but to impress Hitler.

Another World Record for Lycoming!



Moody Brothers Set New Endurance Record for Light Planes with Lycoming "55" Taylorcraft!

That Lycoming engines are *the stars of the skyways* was further evidenced last month when Humphrey and Hunter Moody, pictured above, broke the previous world sustained flight record for light planes by a decisive margin of 125 hours and 3 minutes! Their Lycoming 55-horsepower, dual ignition engine—similar to the model used by Dewey Eldred in establishing two international light seaplane records earlier in the year—admirably withstood the test of more than 14 days of continuous operation. The actual time was 343 hours and 46 minutes before the flying brothers decided to land because of a severe electrical storm . . . Whether you fly for sport, pleasure, business or world records, you can rely on Lycoming to give you championship performance.

See the Lycoming Exhibit in the Aviation Building at the New York World's Fair

FREE LITERATURE—Illustrated folders on Lycoming light-plane engines may be obtained from all Taylorcraft, Cub and Aeronca dealers. Or write Department A99, Lycoming Division, Aviation Manufacturing Corporation, Williamsport, Pa., U. S. A. Cable address: Aviatcor.

YOU CAN RELY ON

LYCOMING

50 to 300 H.P.

Engines

FOR MILITARY TRAINERS, PRIVATE AND COMMERCIAL AIRPLANES

"Backing up all of these extensions and additions to our civil aviation plant, the Authority is at this moment, thanks to the $4,000,000 appropriation in the Third Deficiency Bill, actually making the arrangements for the training of 10,000 student pilots next year by methods we know through test to be methods that produce safe pilots.

ROBERT H. HINKLEY
looks with satisfaction

"Across the river at Gravelly Point, one-half the hydrauliic fill has been completed within the last few days on the National Airport, which will make the Nation's Capitol the beneficiary of an air terminal second to none in the world for beauty, convenience and efficiency. Work has proceeded so effectively and so rapidly under the supervision of the corps of engineers of the United States Army that we can promise the nation that this splendid example of what air transport can do for a community will be available at the Nation's Capitol for all to see and to use before another anniversary rolls around.

"These are the physical things that have been accomplished. Congress, in the Civil Aeronautics Act of 1938, by deciding that economic safety deserved a place second only to physical safety in the development of a civil aviation suitable for the foreign and domestic commerce, the Postal Service and the national defense, recognized for the first time that this commodity, air transportation, had become a utility whose economic soundness was of sufficient importance to the people as a whole to warrant its regulation in a fashion long familiar with public utilities.

"Unexpectedly favorable progress can be reported in this respect. The existing system of scheduled air mail carriers is now legally a public utility. All of the certificates under the so called "grandfather clause" of the Act have been issued to the air mail carriers after the fullest investigation of the adequacy and efficiency of the services they have rendered. This has not been, as was perhaps anticipated, a merely routine procedure. Under the new decision affecting the validity of administrative law, it was necessary to make court-proof records in all of these determinations. A good result of that necessary step has been the development of a mass of information on air line operation which will be invaluable in the determination of cognate actions, such as applications for new services.

"The development of this information has also proved of great use and will prove of further use in determining the economy and efficiency of management as a factor in determining rates for the carriage of mail, fair to the government, the carrier and the public, as the Authority is required to do.

"The determination of these mail rate cases and the hearing and determination of applications for new routes is now actively proceeding. Of the sixteen awaiting decision, one has been assigned for hearing, and the other has been postponed at the request of the carrier concerned.

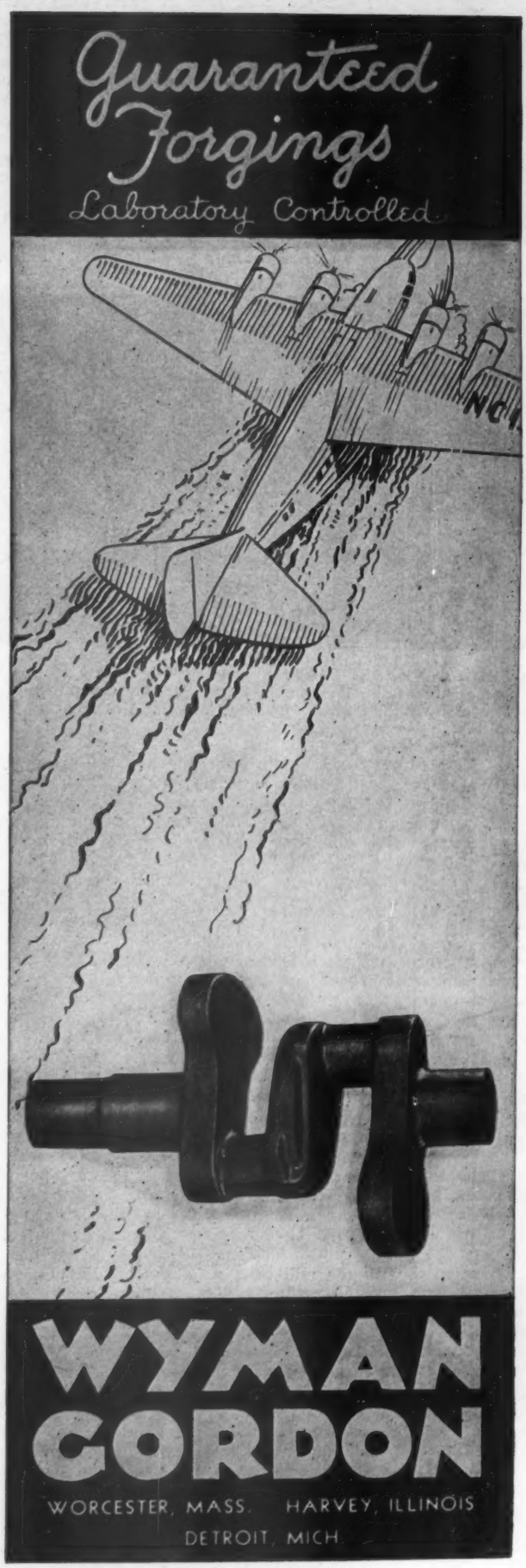
"Of the 59 applications for new routes, one has already been decided, 10 are pending decision after hearing, and 22 have been assigned for hearing.

Congress Was War-, Not Air-Minded

By Blaine Stubblefield

Army and Navy air services out-lobbied civil aviation to a standstill in the First Session of the 76th Congress. While the fighting arms went to town with hundreds of millions to blow, the air forces of peace got economy lectures and thin rations.

Post Office air mail money was doled out grudgingly; Civil Aeronautics Authority was bargained far below its asking figure; C.A.A. pilot training was trimmed to less than half; airport expansion got not a thin dime except that Washington made itself a present of a ten million dollar port out of public money; Congress failed to warm up properly when the air lines turned the heat on for the weather bureau; Coast Guard lost its Kodiak air base; C.A.A. failed to win exemption from the government reorganization act and may rue the day; an attempt to set up an air committee in the Senate laid



an egg; air transport escaped getting its rate-making hand caught in the gears of ICC by a mere squeak and will have to be on guard in future.

Civil aviation's only score, as shots were called, was the NACA $10,000,000 laboratory—and the driving power which won *that* was mostly military. Of course, the pilot training setup, though chipped down to less than half, is really an outstanding victory for C.A.A.

RECORD BREAKERS: Checking their time of 9 hrs. 15 min. for a record cross country bomber flight are, left to right, Capt. S. F. Harmon, Major Stanley Umstead, William Zint and Comm. D. Smith.

In fact the cut may turn out to be good thing, because the next session of Congress is going to pinch pennies till the Indian screams, and is going to be laying for anybody who shows signs of riotous living. It is generally agreed here that C.A.A. is clicking better all the time. Most of the industry and Congress are satisfied with the route certificate output and with rate-making. The whole country is delighted with the year's safety record, in which the gods must have participated; but the credit sits like a halo on the Authority's brow. Nevertheless, with that door open to reorganization, and with those three or four thousand employees riding its payroll, C.A.A. is well off with a show of economy. That goes for its penniless airport expansion too.

But compared with the military, civil aviation did make a mighty poor showing on Capitol Hill. And plenty of observers among our Corinthian columns say that commercial and pleasure flying had better get in and lob with the lobbyists. It's not only a matter of getting federal aid; it's a matter of watching aviation's bill of rights. The railroads are still a giant by comparison. Aviation's bite so far is that of a flea, but it's beginning to annoy the big fellow. He's old but he can still hit. While some good jobs of "educating" were done on the Hill, notably on the omnibus rail bill which might have chained air transport to the aging carcus of other transportation, it is true that prospective beneficiaries of some proposals were noticeably absent. If the industry had made as good a showing in Washington as it did on field and airway, certainly nobody could complain.

There was another reason why air defense flew away with the money bags. Mr. Roosevelt, with the world situation, was mainly it. He couldn't get the majority to agree with him on how to run the country, but he sold the republic 100 per cent on how to keep it. The old-fashioned idea persits that if you put a hand in your side pocket you will find tough guys easier to talk to.

That, so far as this writer can learn, is what Congress voted $2,000,000,000 defense money for. Nobody, from Dorothy Thompson down to the diplomats and the admirals and the generals, believes that this country is in the slightest danger attack for years to come.

More omninous than any threat facing this land is the creeping jeepers against the Monroe Doctrine. It's ten to one we'll defend Hispanic soil first. A bill was defeated which would have permitted the Secretaries of War and Navy to sell munitions and fighting ships to Southern countries, but watch it. It is said that some of those countries would gladly let us defend them, but on the other hand, they might want their own guns to fight among themselves.

This year's nearly three-quarter billion for aviation is, of course, only the beginning. Much of it will be multiplied by all the years ahead, because military power, once started rolling, goes on like a snow ball that never melts.

FASTEST COAST TO COAST: The Boeing B-17 flying fortress whose sister ship broke the bomber transcontinental record on August 1.

Here is the score sheet:

Expansion of the Air Corps	$300,000,000
Regular Army, 1940, Air Corps	74,000,000*
Regular Navy, 1940, Bureau Aeronautics	88,000,000
Navy, twelve air bases, this year	28,000,000
Philadelphia aircraft factory, Navy	2,000,000
Strategic materials	1,000,000†
NACA for new research plant	11,000,000
Pilot training	4,000,000
Coast guard, for sea planes	1,000,000
Naval air reserve	10,000,000
Civil Aeronautics Authority	21,000,000
Post Office, air mail pay	18,000,000
Washington airport	10,000,000
Weather service (Agriculture)	3,500,000
Air Corps bases	62,000,000‡
Civil Airport expansion project	0
	$634,000,000

* Includes $1,000,000 for aviation research.

† Estimated that aviation will use 10 per cent of accumulated strategic materials for which $10,000,000 will be spent this year.

‡ Not a special appropriation; comes out of regular War Department funds.

A. C. Breaks 7 Records

All that flying that the Army airmen did a month ago in honor of their 30th birthday was no mere dress parade. Besides showing the public what our latest planes looked like they also showed what made them tick and succeeded in breaking seven records, four national, three international.

On July 31 a new "super flying fortress" took off from Dayton, Ohio, and carried a load of 31,205, or about 15⅝ tons, to a height of 8,200 ft. to set a new international record. The ship was under the command of Major Caleb Haynes, and was the first to break the record set by a Soviet aviator in 1936. The following day another fortress reeled off 1,000 kilometer (621.3 miles) with a 5,000 kilogram load (11,023 lb.) to set a new world's record with an average speed of 259.4 m.p.h. The Boeing B-17 was piloted by Capt. C. S. Irvine and Capt. Pearl Robey and made its record flight at a height of 20,000 feet. At the same time these land plane marks were set, the amphibian record fell, when at better than 186 m.p.h. Capt. B. L. Boatner piolted a Grumman amphibian around a 1,000 kilometer course.

Not content with carrying away the three international records the Army dusted off a few of their own marks. On August 1 Major Umstead piloted one of the B-17 flying fortresses from Burbank to Floyd Bennett Field in 9¾ hours to set a new Army transcontinental mark. Three other Army records fell at one crack when another flying fortress took a load of 5,000 kilograms to an altitude of 23,800 ft. This not only broke the 5,000 kilo record but it also cleaned out the ones for 2,000 and 1,000 set some time ago by the Army. The ship was piloted by Capt. Robert Olds and, as was the case in all of the records set, was done in a standard Army plane—not in one with everything out but the cables, a point which the Army wishes to emphasize.

These flights were made in conjunction with the Army celebrating its 30th anniversary, and were in addition to its big show at Wright Field, Dayton, and other fields throughout the country. As part of the Wright Field ceremonies several Army officers were awarded high honors for their work in aviation. The Distinguished Flying Cross was awarded to Major Carl F. Green, Capt. Alfred H. Johnson, Capt. George V. Holloman and Capt. Carl J. Crane. Letters of Commendation for their work in aviation were sent by the War Department to Brig. Gen. Frederick E. Humphreys, Colonel Frank P. Lahm, and were read at Wright Field. Lieut. Selfridge, one of the pioneers in establishing the Army Air Service who died in an accident when the Air Corps was still in the incubator stage, was posthumously honored.

AVIATION ABROAD

British Merger Progresses

Lack of ships causes shut down on passengers

Parliamentary battles over the British airline merger haven't been as tough as expected; the general feeling was that anything was worth trying as a way out of the present situation. Opposition to the plan was scattered and couldn't get together on ideas. One set of critics disliked the close tieup of the new line with the Air Ministry; another was afraid the management was being given too much rope. The soundest argument against the merger followed the Cadman committee's opinion that promoting two subsidized lines would keep both on their toes, even though they didn't compete over the same routes. The government stand is that foreign airlines will furnish all the competition that's needed, and they've pushed the merger bill well along toward final passage without any serious changes in the original scheme.

Meanwhile the state of Imperial Airways got sadder yet. What with steadily growing mail loads and lack of equipment, due both to delivery delays and a run of bad luck in losing Empire boats, Imperial has had to suspend further passenger reservations over Empire lines for the rest of the year. There were a lot of howls about mismanagement when the same thing had to be done for a short stretch during last winter's Christmas mail rush, and this time the protests have been so loud and nasty that Imperial is sitting up nights trying to figure a way out. They've announced that they are considering buying foreign equipment, but they'll have to hunt hard to find anyone who can deliver anything that will do them much good this year. The RAF has come through with the offer of bombers to help with this year's Christmas mail, but it's very doubtful that they would be willing to play postman over a longer period.

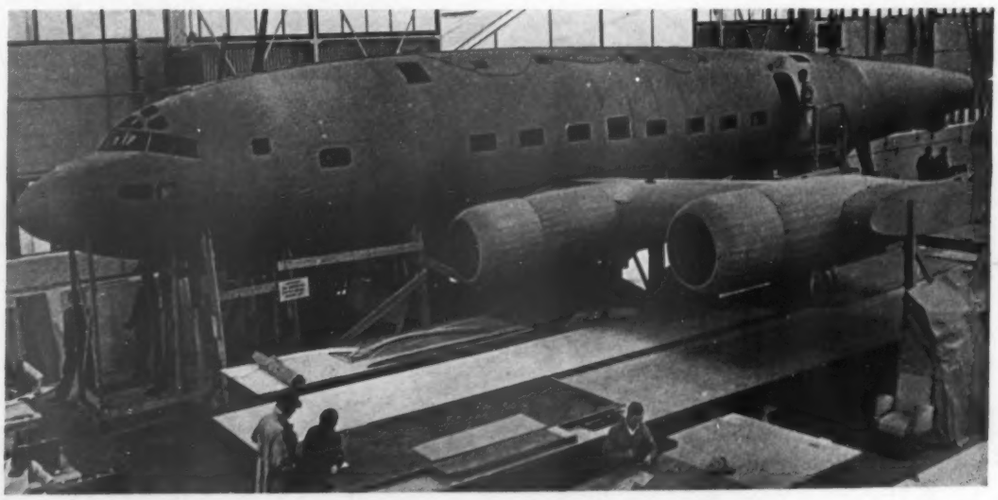
British airline equipment plans for 1940 are still pretty scrambled, as with the present shortage the boys are having to play them as they come and stick ships in where they are most needed without much attention to what they were meant for when ordered. The super Empire boats have been serving as pinch hitters this summer over Empire routes, batting in place of the Ensign landplanes that were scheduled to take over a lot of the work as far as India. Of the three meant for the North Atlantic, one has been lost and the other two will keep the flag flying till fall. Three others now on regular Empire runs are due to be pulled off around then, two for the Australia-New Zealand route and the other for Bermuda. Patriotic Bermudians, by the way, are burned up about this, demanding a ship big enough to stack up alongside the Pan American Boeings.

Sometime this fall the 37 ton G class boats should be ready to go; the first one is now making test flights. They look pretty much like scaled up Empire boats except for having single step bottoms running back to a vertical edge like the Sunderland patrol boats that followed the Empire boats. One construction novelty is fastening the hull plates to longitudinal stringers only and not to the frames, which keeps transverse wrinkles out of the bottom under water loads.

Just where these boats will be used is still something of a mystery, and it's an even break that Imperial may not know either. Apparently they were planned for mail only over the North Atlantic, or mail plus passengers over Empire routes. The three on order won't have passenger accommodations as first turned out. While they may make a few North Atlantic trips, our guess is that they'll wind up before long either on the regular Empire routes or on the South Atlantic. If Britain keeps her promise to get that route going by the end of the year, these boats look like naturals for it. The Australia-New Zealand line is another possibility.

The North Atlantic problem is a tough one for Britain. She hasn't any boats under construction that are suitable for a regular service with passengers. The chances are that the G class boats could be overloaded up to doing it, but this would probably mean waiting for a new beefed up series of them. Worse yet, her real interest is in a direct link with Canada, and with ice in the harbors this means landplane equipment for the biggest part of the year. She still promises passenger

ENGLISH GAIN BY MILES: The new Phillips and Powis Miles Master incorporates the latest in English design with a Rotol propeller, ejector exhausts, and a wide retractable gear.



MODEL TO MOCK-UP: The mock-up stage has been reached in the development of the new Fairey 4-engined transport, a model of which was at the Paris show last year. (See Aviation, Jan., 1939.)

service in 1940, and our money is on the Short landplanes now under way to do the job.

The specifications drawn up for them by the Air Ministry last year look as if they were meant for it. They call for a range of 3,000 miles against a 30 m.p.h. headwind, a crew of seven, and 7,500 lb. payload. Two of the ships are designed to operate at 10,000 ft., where they are expected to have a still air range of 3,400 m.p.h. at 245 m.p.h. The third ship will have a pressure cabin and will operate at 25,000 ft.; it is counted on to do 3,390 miles at 275 m.p.h. Lots of room to sleep 12 passengers will be provided, and the whole layout of the crew and passenger quarters looks like business. If these ships do come along in 1940 and Britain can start off with a bang on a direct high speed service, she'll have done a lot to take away the sour taste of this year's delays, so don't be surprised if something along these lines turns up in the news before long.

AS OTHERS FLY IT

Foreign Menace Eases in South America

Some of the jitters over the political and military potentialities of foreign airline networks in South America may be calmed a bit by a couple of happenings that show the locals aren't inclined to let the lines have their own way too much. SCADTA, the German line that pioneered the field, has been pushed by the Colombian Government into a merger with SACO, a local company. A majority interest in SCADTA, largely German owned with some participation by Pan American and Colombian money, will go to Colombians, and the entire board must be citizens of the country. Further south the line set up by Ala Littoria as a feeder for its projected transatlantic route has got into a jam with the Argentine government. The Italians hired some well known local men as copilots to help out with the permit terms that all pilots had to be citizens by the time six months were up, but carried them along just for the ride. When the government found the Italians wouldn't let the local boys take the ships out, it closed down the services for an investigation. The Argentine president of the line resigned and the law is now checking up on whether its incorporation as an Argentine company was phoney. The Italians apparently started out with a great frenzy of fascist salutes and a semi-military air that got a big section of public opinion down on them at once.

One for the books was the intra-Axis double play that set and broke a world's record all in one day. The Germans started it off by sending a Heinkel long range mail plane 6,210 miles around a closed course at an average of 134 m.p.h., adding about 18 m.p.h. to the former record set by Japan. Just about the time the Germans got down the news came that the Italians had done the same stretch at 147 m.p.h. and had gone on from there to set a new closed course distance record of 7,763 miles. This still left things about even, for two days before a new Junkers bomber turned in an average of 313 m.p.h. over 1,242 miles with 4,400 lb. useful load, knocking over the 292 m.p.h. record held by Italy.

The backdoor route from Europe to Asia now looks to be in for another seige of political maneuvering. Just a short while ago Eurasia was on the point of starting the run in conjunction with Aeroflot, the Russian state airline, and even made a couple of flights. Now Eurasia seems to be swinging back to its original German tieup and planning to connect with Deutsche Lufthansa in Siam. The idea calls for the Germans, whose Far East service is now out as far as Afghanistan, to come on through to Bangkok. Meanwhile there are stories that the Swedish line ABA, which in the last few years has replaced Lufthansa as the main link between Europe and the Russian lines, will team up with Aeroflot to run a Stockholm-Moscow-Vladivostok service. This Moscow-Vladivostok line is another that has been going to start "next month" for years now; latest reports still had the Russian improving ground facilities and sending a survey flight out now and again.

Grey Resigns

Edited "Aeroplane" 28 years

The resignation of C. G. Grey, editor of *The Aeroplane* for 28 years, had been predicted pretty freely the last few months, but to have it really happen was still something of a shock. There wasn't a subject from the virtues of slots to the low quality of present day beer that C. G. didn't have decided opinions on, and he didn't hesitate to state them on every possible occasion in his columns. It was a rare issue that didn't bring a bunch of tempers up to the boiling point, but as long as the arguments were over aeronautical matters everyone cooled down before long and admitted that C. G. might have some good ideas. In the last few years, though, the arguments drifted more and more toward politics, and equally patriotic Britishers who didn't agree with his pro-Axis ideas on foreign policy were called some pretty hard names that weren't easy to forget. He will be succeeded by Edwin Shepherd, aviation writer for the London *Times*, who has taken on a real job in carrying on a magazine that was always full of thoughts for the week, no matter how many faithful readers frothed at the mouth at some of them.

Brussels Show

Allies match Axis in exhibits

The main feature of the second Brussels show wasn't any astounding aeronautical novelty, but was the way the British and French went full out to make their exhibits the most impressive, reversing the situation from the last show in 1937 when the Germans topped everyone else by a long way. It was a fine example of the aviation muscle-making the democracies have been pulling all over the map. The chief British pride was the special Spitfire originally built for a crack at the speed record and now used by the RAF for high speed research. It has a Rolls-Royce Merlin boosted up to some big figure at sea level, clipped wings, and a cooling system that left the boys all guessing. There was a tiny radiator stuck on under one wing like an afterthought, which according to gossip is used only on long flights. On short speed dashes the engine is supposed to be cooled by letting the liquid boil away without trying to condense it. The ship has appeared before with a more or less conventional ducted radiator under the belly. At the show it had a three bladed controllable prop, but it was said to have been flown over with a four blade wooden one with fixed pitch.

French ships with radial engines generally sported the trick cowlings and overgrown spinners that they've been working on. This system was carried to a new high in the case of the Belgian Renard fighter, in which the gap between the cowling and spinner was cut down to a good sized crack. The French also brought along some interesting bomber models first seen at the Paris show of ships too hush hush to show in person. The NC 110 heavy bomber has two Hispano engines in tandem in a wing nacelle on each side, driving oppositely rotating coaxial tractor props. The NC 150, built for plenty of speed, has two Hispano 12Ys to pull it and another Hispano 12X pumping air with a three stage supercharger, a system the Russians have used with some of their big bombers. This arrangement is supposed to give the 12Ys a critical altitude of better than 30,000 ft., and the ship is said to have bettered its design speed of 373 m.p.h. at 23,000 ft.

The Germans showed one of the latest models of their Junkers Ju 87 dive bomber, this one with a Jumo 211 engine turning out around 1,000 hp. It looks like a good solid service ship. The spoilers for reducing diving speed are pretty simple; a streamline section supported out a bit from the under surface of the wing near the leading edge is turned flatwise when you want to run up the drag.

The big German attraction was the Daimler-Benz BD601Aa engine, which not only has direct injection but also has something new, a hydraulic supercharger drive that automatically controls the blower speed. It has a takeoff rating of 1,175 hp., which works out to about 1.08 lb. per hp. Direct injection was a feature of almost all the German engines, but there were stories around that overhauls about every 25 hours are necessary with it. In spite of this, about 70 per cent of German service ships are said to use it.

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MANUFACTURE OF MILITARY AIRCRAFT IN VOLUME
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. . . that's the equivalent of *Taylorcraft's*

New World's Record Endurance Flight

PILOTS HUNTER AND HUMPHREY MOODY FLY TAYLORCRAFT NON-STOP FOR 14 DAYS, 7 HOURS, 46 MINUTES

Congratulations to the Pilots of Miss Springfield

Shattering by 125 hours the former world record for light planes of 218 hours and 43 minutes, two young brothers, Hunter and Humphrey Moody, piloted their Taylorcraft over a 30 mile course at the Springfield, Illinois Municipal Airport for 343 hours and 46 minutes continuous flight—over 2 weeks in the air. The distance covered non-stop was greater than the distance around the world at the equator. After this gruelling grind both the Taylorcraft plane and its dependable 55 H.P. Lycoming engine were functioning beautifully. The flight was terminated only because of a severe wind and electrical storm.

Again, Taylorcraft's outstanding stamina and dependability have been proven—the third world's record flight for Taylorcraft this year. You may never wish to subject yourself or your plane to such exhausting tests, but it is vital that the airplane you buy and fly be capable of meeting the extraordinary in performance requirements.

The remarkable feat of two men sitting in an airplane continuously for over two weeks—flying it non-stop for 27,000 miles—demonstrates beyond all doubt the trustworthy performance, the ease of control and the relaxful comfort which have made Taylorcraft the choice of wise buyers.

See and fly this most amazing airplane value of today. It's the ship you, too, will surely choose to own. Write us for the name of a nearby Taylorcraft dealer and a demonstration flight will be arranged.

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AVIATION MANUFACTURING

Allison Rushes Plant

250,000 sq. ft. unit to handle new orders

With $15,000,000 worth of Army Air Corps orders on hand for their big, liquid-cooled engines, Allison Engineering Division of General Motors Corporation is rushing work on their new factory at Indianapolis, with occupancy anticipated by fall. The quarter-million square foot plant is designed to comprise a complete manufacturing and assembly layout for high precision work combined in a single, integrated unit. Incoming materials at a receiving dock at the east end will move into production in two lines along the north and south walls, while the press shop, welding department, heat-treating and other metal finishing will be located on middle aisles. Parts will move into sub-assembly and final assembly as they move toward the west end, where the shipping department will be located. The plant will be entirely of welded steel framework, with face brick exterior. It is to have air-conditioning, acoustical walls, uniform illumination 24 hours a day, and a power plant equipped with diesel engines for supplying all the power for manufacturing and lighting.

North American

North American Aviation, Inc., delivered more than $12,000,000 worth of aircraft during the first six months of 1939 according to a statement issued by J. H. Kindelberger, president. Earnings for the second quarter of the year are estimated to be in excess of the record figure of $1,355,952 reported for the first three months of the year. Output is now exceeding all previous production records, with 70 planes delivered during April and 80 shipped in May. As the plant is working on a five-day week basis, this represents a production rate of four planes per working day. Most of these deliveries are against a British order for 400 planes and a French order for 200 planes of the basic trainer type, with a strong likelihood that the French order will be increased by an additional 200 planes of the same type. Meanwhile regular production has been conducted on U. S. Army orders for planes of training and observation type. Appointment of Leland R. Taylor as Eastern representative of North American, with headquarters in Washington, D. C., has been announced by Mr. Kindelberger.

Navy Orders Grummans

Grumman Aircraft has recently received a contract amounting to $1,786,860 from the Navy Department for airplanes and airplane parts. This contract brings the Grumman backlog order total up to $4,600,000.

Lockheed

Setting an all-time high for deliveries in any six months, the Locheed Aircraft Corp. delivered $12,500,000 worth of aircraft during the first half of 1939 according to an announcement by Robert E. Gross, president. This represents an increase of approximately 145 per cent over the previous high of $5,111,699 in the first half of 1938, and materially exceeds the $10,274,503 sales of the full year 1938.

Commenting on the present schedule of deliveries Mr. Gross said, ". . . deliveries of $7,000,000 were made during May and June, or in excess of $3,000,000 a month. . . . Lockheed is completing between 30 and 40 units per month, or better than one a day. . . . At the time the British Government placed its order . . . the plant was operating with about 2,500 men, turning out approximately ten planes a month. . . . In the relatively short time since the first (British) plane was delivered in January, production has been accelerated to the present one-a-day rate, personnel has been increased to over 7,000, and payroll to over a million dollars a month. In the interest of national defense it should be reassuring to the American public to know that such quick results can be achieved if the buying program is sufficiently large to lay out a real production campaign." Early in August the Lockheed company finished the last of a fleet of fifteen transport planes for Trans-Canada Air Lines. More than $175,000 in new commercial business was booked during July. To better its European sales position Lockheed has established a $100,000 wholly-owned subsidiary in Amsterdam known as the Lockheed International Sales Company with P. H. White as managing director. According to Carl B. Squier, sales manager, this firm will provide complete facilities for servicing and maintaining all types of Lockheed aircraft.

During August the company swung into production on an order of 50 twin-engine bombers for the Australian government.

Kinner Engine Returns

The name Kinner has once more returned to the engine manufacturing field and with it is offered 385,978 shares of Kinner Motors stock with a one dollar par value. This reorganization has come through the purchase of the Kinner Airplane and Engine Corporation Ltd., and the new firm will concentrate on engine manufacturing.

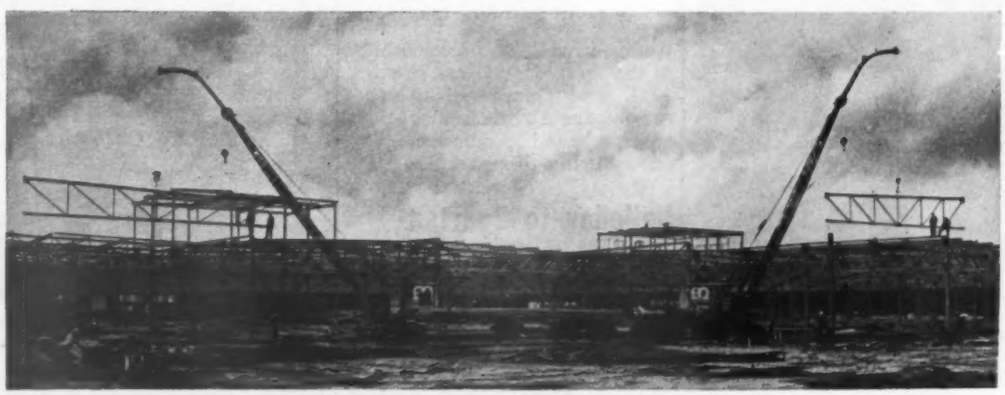
Three standard models will be produced under the Kinner name, a 100, 125 and 160 horse power engine being all ready for manufacturing at present. Under development is a new seven cylinder motor in the 350 to 400 horse power range, and experiments have been run on a 160 horse power engine whose radical parallel cylinder design permits air cooling with a very low frontal area. Tests on this model have proven satisfactory for more than 1,000 hours and the proto-type engine will be ready for block testing in the near future.

The officers for the new company are: B. B. Robinson, President; Arthur Lee, Vice President; Reele L. Milner, Secretary-Treasurer; and Earl Herring, General Manager.

Dorrell, Vega

Mac Short, president of Vega Airplane Company, Burbank, Calif., has announced the appointment of Vernon A. Dorrell, chief pilot of the company, to the position of sales manager. Dorrell is a veteran pilot, having been flying since 1924. He joined Pan American Airways in 1929. In 1936 he went to Australia to introduce a fleet of Lockheed transports for the Lockheed Aircraft Corp. In 1937 he was named operations manager of Mid-Continent Air Lines, of Kansas City, and in 1938 he joined the Vega Airplane Company as chief test pilot. Early in July he conducted first flight tests of the new Vega and will continue to supervise the Vega test program in conjunction with his new duties.

The Vega Airplane Company has also announced receipt of an additional contract from



MORE ROOM FOR ALLISON: With 250,000 sq. ft. floor space and the promise of a speedy production line, Allison's new Indianapolis plant ought to turn out quite a few engines.

VERNON A. DORELL
New sales manager for Vega

Lockheed Aircraft Corporation for parts and accessories which increases the parts business backlog to about $750,000. The new contract calls for various minor assemblies and machined parts to be installed in both the commercial and miiltary aircraft under production by Lockheed. The Vega factory is located in Burbank and adjoins the plant of the Lockheed corporation. The Vega company now employs more than 500 persons and has 102,000 sq.ft. of floor space available for production and expansion. Work on the new parts contract will not interfere with production now under way on a unit of five of the new Vega Starliner light transport planes powered with the Menasco Unitwin powerplant. The first Vega Starliner is now undergoing exhaustive flight tests.

No. Amer. Posts Taylor

North American Aviation has announced the appointment of Leland R. Taylor as its eastern representative in Washington. Acting as liaison man for the company, Mr. Taylor will handle its contacts with the army, the navy and the Army Air Corps' division of material and procurement at Wright Field, Dayton, Ohio. This work was formerly among the duties of J. H. Kindelberger, president of the company.

LELAND R. TAYLOR
now of North American

Luscombe

Luscombe Airplane Co. celebrated the completion of its 200th all-metal light plane on Aug. 1 with a company picnic in West Trenton, N. J. Three Luscombe seaplanes were delivered in August: One to Mr. Jesse H. Knight for use in Columbia, South America, another to Dr. Miles Robinson of Philadelphia, and one to Mr. John D. Maher of Greenwich, Connecticut. Recent exports include a ship to Mombasa, Kenya Colony, East Africa. 25 new Luscombes were ordered between July 15 and Aug. 15.

Heads Seversky Exports

Lieutenant Colonel H. W. Flickinger (retired) of the United States Army Air Corps has joined the Seversky Aircraft Corporation staff as Director of the Export Division. Lt. Colonel Flickinger graduated from Massachusetts Institute of Technology in the courses of Mechanical and Aeronautical Engineering, was commissioned in the Army Air Corps in early 1917 and remained in that service for 22 years in various technical and production positions during this period.

COL. H. W. FLICKINGER
moves into Seversky

Holladay to Spartan

The Spartan Aircraft Company has announced the appointment of H. Warren Holladay as its new sales manager. Previous to this appointment he owned and operated Gulf Airways, a seaplane flying service in Fort Myers, Florida.

Holladay has spent two years

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ACCESSORY DRIVES?
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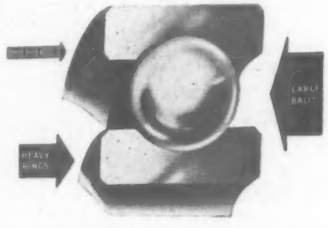
FAFNIR MEANS *Extra* CAPACITY

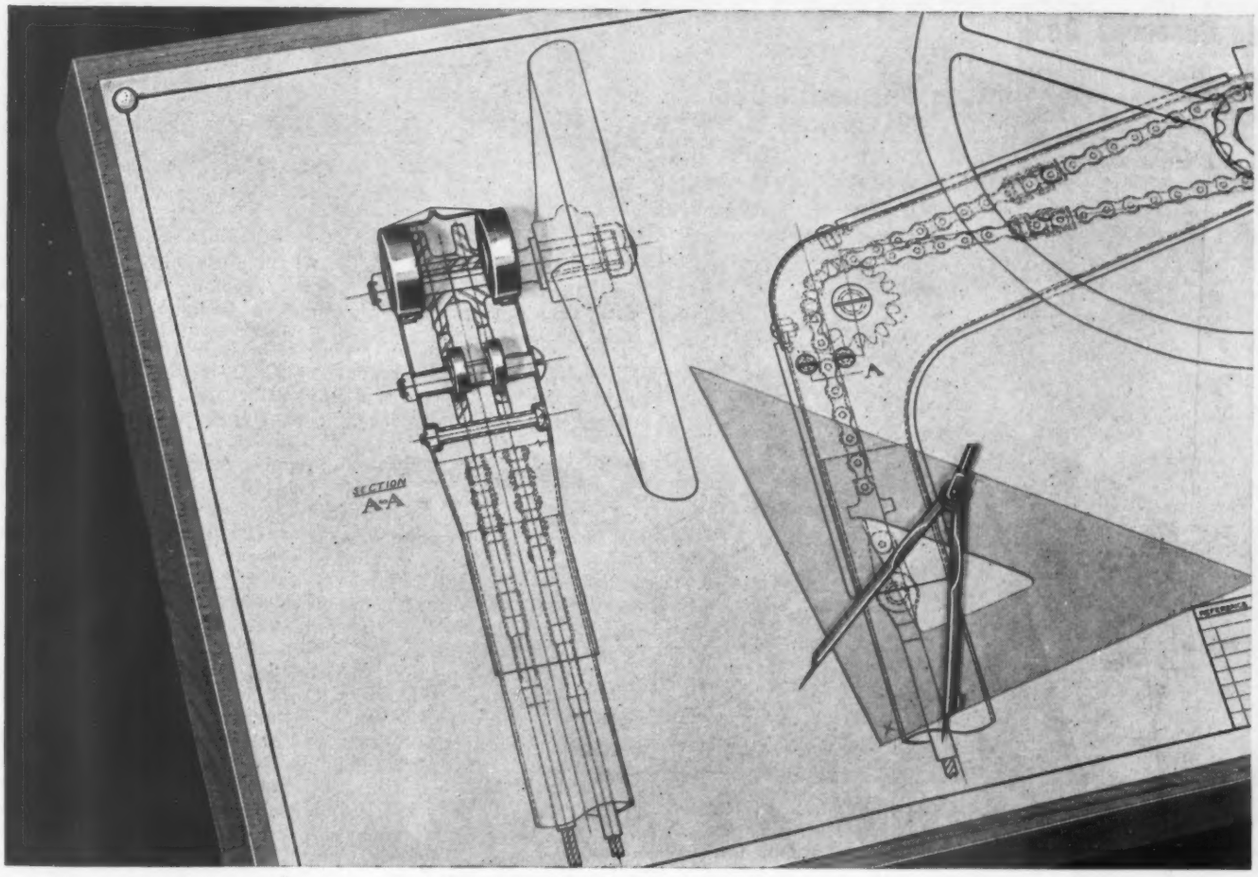


While you're building the advantages of ordinary ball bearings into the heavy-service spots of your ship, you might as well add the extra ruggedness, longer life and maintained rigidity assured by Fafnir's balanced design. Larger balls, rolling friction-free in deeper races, add a big plus to ordinary ball bearing performance . . . a big extra margin of radial and thrust capacity built into the whole Fafnir line. Write for the Engineering Manual, sent free to designers and executives. The Fafnir Bearing Co., Aircraft Division, New Britain, Conn.

FAFNIR

THE BALANCED LINE . . .

Engineering is a better cure than Turnbuckles for "LATERAL LOCOMOTOR-ATAXIA"



WHEN YOUR RIGHT FOOT doesn't know what your left foot's going to do, it's either locomotor-ataxia . . . or too much joy-juice. But when a control wheel doesn't know what the ailerons are going to do, you can't blame it on John Barleycorn! A poorly-mounted wheel, or badly-supported chain sprockets, will do it every time. And tightening the turnbuckles just prolongs the agony.

If you, like Lockheed, apply the cure in the blue-print stage, you'll get the complete immunity shown above. The radial load of the cable tension is carried effortlessly by two Fafnir K8 Ball Bearings combining over 11,000 pounds capacity . . . prepacked with lubricant . . . double sealed with stainless steel shields. The chain rides over friction-free sprockets completely devoid of any wobble . . . thanks to a Fafnir K6A Ball Bearing in every one.

Don't call a huddle for a special aircraft ball bearing until you've checked the extensive Fafnir line. Fafnir Catalogs show dimensions and characteristics of the right bearing for every spot on every ship . . . developed in ten years of close cooperation with the aircraft industry . . . proved in performance in almost everything that flies. The Fafnir Bearing Company, Aircraft Division, New Britain, Conn. The Aircraft Bearing Specialists.

Ball Bearings . . . MOST COMPLETE IN AMERICA

For Aircraft Engines and Controls

in the Sales and Service Departments of Fairchild Aircraft Corp. Also working in the Sales Department he at various times was connected with the Kellet Aircraft Corporation of Philadelphia and in the production department of the Keystone Aircraft Corporation. Besides this he has done free-lance selling and operated flying services in Virginia.

Hamilton Succeeds Doak

Walter A. Hamilton has been named manager of the El Segundo Division of the Douglas Aircraft Company, Inc., according to an announcement by Major Carl A. Cover, general manager. E. R. Doak, formerly vice president of the Douglas Company and manager of the El Segundo Division, has resigned to enter a private business venture. Eric Springer, pioneer Douglas test pilot and assistant superintendent of the Santa Monica plant, has been transferred to the El Segundo plant to act as assistant manager there. Harry Williams, formerly night superintendent at the Santa Monica plant, has been named superintendent of the El Segundo division. Five additional acres of land have been purchased adjacent to the El Segundo plant to provide for contemplated expansion.

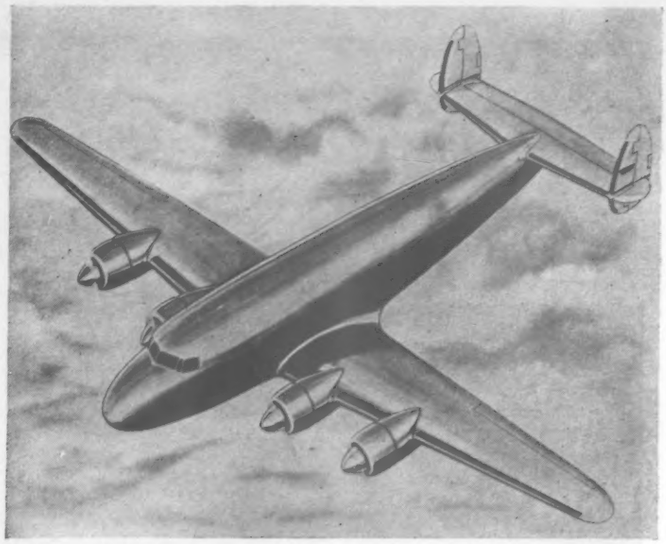
HAMILTON TAKES OVER DOUGLAS POST: William Coyle (on the wing) former chief pilot for TWA congratulates Walter Hamilton on his appointment as manager of the El Segundo Douglas plant

Hangar Order to Butler

One of the largest orders of its kind, calling for delivery of 14,500 special steel buildings, has been awarded to the Butler Manufacturing Company, Kansas City and Minneapolis, by the United States Government. The order amounts to $2,303,975, and delivery is to be made by Oct. 15. To make scheduled delivery the company has purchased and installed $125,000 of additional machinery, and will put more than 500 additional men on its payroll. Three factory shifts will be worked day and night, and all factory and office employees will receive a bonus of 10 per cent on wages and salaries upon completion of the contract on schedule.

Timm Files with SEC

Timm Aircraft Corp. Van Nuys and Glendale, Calif., has filed a registration statement with the Securities and Exchange Commission covering 425,000 shares of $1 par value common stock to be offered the public at $1 per share. Proceeds will be used for equipment and working capital. The Timm company is widely known on the West coast as an aircraft repair base. Under the expanded program aircraft repair work will be concentrated at the Glendale shops and manufacture of aircraft and parts will be carried on in the new plant on Metropolitan Airport, Van Nuys. In addition to development of the Timm twin-engine light transport plane (described in AVIATION, April, 1938) the Timm company is entering the military market with a trainer and a pursuit design. The Timm trainer is developed from the Kinner sportster, all Kinner aircraft design rights having been purchased recently; while the pursuit is a development of the Hughes racer design which has also been purchased by Timm. It is planned to enter the Hughes racer in the current Bendix Trophy race.



THE LOCKHEED EXCALIBUR: This is what the model 44 will look like when out of the mock-up stage. With an estimated top speed of 240 m.p.h. a 4-engine ship is a new step for Lockheed.

Al Menasco Retires

Al Menasco, well known for his work in developing the Menasco series of inverted in-line aircraft engines, has retired from aviation to become a retail Ford dealer in Culver City, Calif., a suburb of Los Angeles. It was in Culver City, 24 years ago, that Menasco won a design reputation through his work in building and racing midget motor cars. Menasco designed and built his first aircraft engine in 1926, and presided over the Menasco Manufacturing Company for the following twelve years, during which time Menasco engines gained wide recognition for their performance in small racing planes, and in private and sport aircraft. During 1915, '16 and '17 Menasco toured the Orient as manager and mechanic for Art Smith, during which time Smith taught Al Menasco to fly.

Corbet on Boeing Board

The election of Darrah Corbet, prominent Seattle business executive and civic leader, to the board of directors of both the Boeing Airplane Company and its manufacturing subsidiary, Boeing Aircraft Company, has recently been announced.

Mr. Corbet is president of the Smith Cannery Machines Company, a position which he has held for the past ten years. Previously he was for twenty years manager of the Seattle office of Charles C. Moore and Company, engineers, of San Francisco.

Born in Brookville, Pennsylvania, Mr. Corbet is an engineering graduate of Yale University, holding both bachelor's and master's degrees. He joined the C. C. Moore and Company in 1906, first as a draftsman in San Francisco, then doing engineering and test work in San Francisco and Los Angeles prior to his move to Seattle in 1909.

Barkley-Grow Steps Up

Increased orders for the Barkley-Grow T8P1, now operating on ski equipment in Canada on regular transportation runs, has forced the company to start production of an additional group of five such ships at their Detroit factory, with prospects that the group will be increased to ten. The installation of Edo floats on these ships is now being completed and tests are expected to be run shortly.

Barkley-Grow officials have announced that the following additions have been made to the factory staff:

Mr. Allen J. Dysart, formerly of Seversky, Consolidated and Curtiss Aircraft Company, as Chief Inspector.

Mr. George Burell, formerly of Seversky, as staff pilot.

Mr. E. F. Skocdopole has been appointed chief test pilot.

A Pin for Pedler

James S. Pedler, manager of aeronautics for the B. F. Goodrich Company, Akron, Ohio, and indeed a well known figure in aviation circles has completed ten years of service with Goodrich and received his service pin from company officials.

Pedler, in charge of Goodrich aviation activities for the past

five years, is an overseas veteran of the French and American Flying Corps, is a member of the Quiet Birdmen and the American Legion.

Grumman

Grumman Aircraft Engineering Corporation has increased its Board of Directors from five to seven members. The two new directors are William T. Schwendler, chief engineer, and B. Allison Gillies, executive manager of the company.

Coyle to Douglas

William Francis ("Bill") Coyle, veteran T.W.A. pilot, has been assigned to the staff of Douglas export sales pilots according to announcement by Major Carl A. Cover, Douglas general manager. Coyle saw service in France during the World War and is now an officer in the U. S. Air Corps Reserve. He is currently flight testing the attack bombers being built in the El Segundo Douglas plant for delivery to the Netherlands Government.

Earle Now A V. P.

Robert L. Earle has been promoted to the position of Vice-President in the Curtiss-Wright Corporation. Formerly Earle was general manager of the Curtiss Propeller Division of the corporation, at Clifton, New Jersey. This promotion has followed ten years of service with the company, when in 1929 he started as assistant head of the organization's Washington office. In 1933 Earle became head of that office and in 1937 became assistant to the general manager of the Curtiss Aeroplane Division, and remained there until he became the general manager of the newly formed Curtiss Propeller Division in 1938.

Exports Still Climbing

Aeronautical exports of $10,619,563 from the United States during June set a new all-time monthly record. France and the United Kingdom accounted for $6,298,350 of the total trade, while Mexico's purchase of 27 planes amounted to $1,274,610. Breakdown of the total is: 149 planes at $6,524,159; 195 engines at $1,468,531; instruments and accessories at $2,624,572; parachutes and parts at $2,171; one glider at $130. Total foreign sales of domestic aeronautic equipment during the first six months of 1939 were valued at $48,866,612, a 31.63 per cent excess over the corresponding period in 1938.

ENGINEERING

Dow Guard For Mg

The development of new protective and decorative coatings for magnesium alloys has recently been announced by the Dow Chemical Company.

According to Dow technicians two of these coatings known as Treatment No. 7, and Treatment No. 8 surpass other known treatments in protecting magnesium alloys against salt water, and upon general atmospheric exposure result in satisfactory adhesion surfaces for subsequent paint systems. Since they introduce no dimensional change, the new treatments may be used on parts machined to close tolerances.

Treatment No. 7 is usually applied to Dow metal parts after they have been machined. Dow research men claim that all surfaces, even deep holes, treat equally well. The treatment imparts a dark brown to black finish on most alloys, and may be used on all except Dowmetal M.

Treatment No. 8 may be used on all alloys and forms including Dowmetal M. It is said that this treatment does not affect machined dimensions and leaves machined surfaces with their original lustre. Complete treatment is obtained on all surfaces, including the bottoms of deep holes. Tidewater tests recently completed at Miami, Fla., show Treatment No. 8 to be extremely effective in protection against salt water corrosion.

Some measure of success also has been attained in experimental electro-plating of Dowmetal. Although this is not in commercial use at the present time, it gives great promise of value in this direction for the future.

Templin Gets S.A.E. Post

Ellis W. Templin has been named chairman of the governing board for the Southern California Section of the Society of Automotive Engineers for the 1939-40 year. Templin is an automotive engineer for the Los Angeles Department of Water & Power, served as chairman of the Philadelphia section in 1926, and has been a member of the S.A.E. for twenty-one years. Others elected to the board of the Southern California section are: John Wiggers, Moreland Truck Co.; Brint Edwards, Douglas Aircraft Company; Joe E. Robbins, Paramount Pictures, Inc.; Dr. Ulric B. Bray, Union Oil Co.; Capt. Wm. A. F. Millinger, U. S. Army Air Corps Reserve; Fred C. Patton, Los Angeles Motor Coach Company; and Larry J. Grunder, Richfield Oil Corp.

The S.A.E. serves more than two thousand engineers in the Los Angeles area, a majority of whom are engaged in aircraft work. Present plans call for substantial expansion of the society's service to aircraft engineers in the area, with special aviation meetings planned for such important centers as Glendale, Santa Monica, and San Diego. A National Aircraft Production meeting is scheduled for Oct. 5-7 under the direction of Mac Short, president of the Vega Airplane Company.

Ebel Chief At Martin

Announcement has been made of the promotion of William K. Ebel, Assistant Chief Engineer, to the post of Chief Engineer of the Glenn L. Martin Company. Ebel, who attended Heidelberg (Ohio) College and Case School of Applied Science, Cleveland, graduating in 1923, first joined the Martin organization in 1922 when, between junior and senior years, he worked in the Engineering Department of the Martin plant, then located in Cleveland. After graduation he attended the Army flying school at Brooks and Kelly Fields but rejoined the company and has been associated with it ever since, except for three months in 1925.

In addition to his intimate, first-hand knowledge of practical flying requirements, Mr. Ebel brings to the position of Chief Engineer an extensive experience covering all phases of Aviation, including the design and manufacture of a wide range of types of military, naval and commercial aircraft. In the transport field his research into

CURTISS FOUR-WAY PROP: Designed for "bigger and better" engines now on the boards, this prop has all the latest features

Int. Congress Postponed

The aviation boom at home and abroad has so much occupied the engineers and scientific specialists that were planning on attending the International Congress of the Aeronautical Sciences in New York in September, that it has been decided by the Council of the Institute to postpone the Congress until 1941. The plans of this Congress will be announced next year. However, the Institute of the Aeronautical Sciences has expressed appreciation of the great interest that has been evidenced in holding such a Congress.

WILLIAM K. EBEL
Moves up in the world

C-W's Four-Blader

Keeping in line with the latest motor developments Curtiss-Wright has recently brought out their new four bladed controllable pitch propeller. The addition of another blade is aimed at absorbing the ever increasing horsepower of current engines without exceeding the bounds of reason in increased diameters.

According to Robert L. Earle, now vice president of Curtiss-

Wright, in charge of its Curtiss Propeller Division, "to absorb the horsepower being developed in some of our new engines with the now conventional three bladed propeller, it would be necessary to increase the propeller diameter to such an extent that the plane would require a larger, heavier landing gear. The four-bladed propeller will absorb this increased engine power without any increase over present propeller diameters and still efficiently absorbing an equal amount of power."

The new propeller is equipped with aluminum alloy blades, and like other Curtiss types, is electrically controlled, incorporating the features of "full-feathering", constant speed and selective pitch control.

Display For The S. A. E.

An Aircraft Engineering Display will be a new feature of the SAE National Aircraft Production Meeting in Los Angeles, October 5, 6 and 7, which will have headquarters at the Hotel Biltmore.

The new display will furnish a meeting place for examination and discussion of the newest products of the aircraft supply industries and is being developed at the request of the leading aircraft engineers and executives. J. H. Kindelberger, president, North American Aviation Corp. heads the committee under whose auspices the Aircraft Engineering Display will be operated. Mac Short, president, Vega Airplane Co., is general chairman for the meeting as a whole.

Menasco Waco?

Although no official announcement has confirmed the report, it is rumored that the Menasco Manufacturing Company has installed one of its newest C6S4 "Super-Buccaneer" engines in a Waco cabin plane and will shortly conduct a national sales and demonstration tour to interest various manufacturers, as well as aircraft dealers, owners and operators, in the advantages of the inverted, in-line type aircraft engine. The Menasco C6S4 is an approved engine rated at 260 hp.

Slot Patents Expire

In last month's AVIATION we described the Lockheed wing slots as discussed by Hall Hibbard, who stated that, as they were no longer patented, there was no corner on the American built-in slot market. It now appears that as of July, 1939 the basic patent and the three most important modification-patents held by Handley Page on the orthodox external slot have also expired. H. P. still holds rights to some detail improvements on the idea, but it is now perfectly legal for any and all engineers proudly owning a French curve and a ten cent pencil to draw wing slots to their hearts' content.

Thus is removed one of the greatest obstacles to the incorporation of this undisputedly-successful safety device on many types of small commercial planes which could use it to advantage.

FINANCE

» AERO SUPPLY MANUFACTURING CO., INC., for six months ending June 30, 1939, net profit of $48,233, equal, after dividend requirements on Class A stock, to 9 cents each on 412,461 shares of Class B stock. For like 1938 period, net profit of $59,162 or 12 cents a share on Class B stock. Unfilled orders at June 30 of $193,300 compared with $184,400 for 1938.

» AVIATION CORPORATION AND SUBSIDIARIES, for six months ending May 31, 1939, net loss of $1,000,207, against a net profit of $388,993 for the same period in 1938, which was equal to 14 cents a common share.

» BEECH AIRCRAFT CORPORATION, for nine months ending June 30, 1939, net loss of $54,-986, compared with loss of $31,198 in same period of 1938. Sales totaled $923,676, against $763,546 last year, a gain of 21 per cent.

» BARNARD AVIATION EQUIPMENT CO., manufacturers of "Barnco" armament equipment, filed registration statement with SEC for 60,000 shares of common stock at $1 par, to be publicly offered at $1.65 a share. Company announced it is supplying items for installation on planes being manufactured in this country for the British and French governments.

» BENDIX AVIATION CORPORATION AND SUBSIDIARIES, for first half of 1939, net profit of $2,-168,210 after depreciation, interest and taxes, equal to $1.03 each on 2,097,663 shares of capital stock. Compares with loss of $495,999 for like 1938 period. For second quarter of 1939, net profit was $1,144,214 or 54 cents a share; for first quarter, $1,023,996 or 49 cents a share. Net profit for second quarter of 1938 was $65,641 or 3 cents a share. Redemption of $3,000,000 ten-year 3½ per cent debentures was authorized.

» BOEING AIRPLANE CO. AND SUBSIDIARIES, for six months ending June 30, 1939, net loss of $183,550. Consolidated gross sales of the three constitutent companies was $3,538,270; sales and operating expenses was $3,-590,566; depreciation, $75,160, making an operating loss of $127,456. Other income, $28,-244; other deduction, $84,339. Unfilled orders as of June 30 were $13,031,647, against $13,-924,652 on March 31. Cost of six Pan American Clippers delivered in the period was carried at sales price. Disposition of excess developing and manufacturing costs over sales price has been deferred until the end of this year.

» FAIRCHILD AVIATION CORPORATION, for the six months ending June 30, 1939, net earnings of $141,121 or 41 cents a share, after all taxes but subject to year-end adjustments. Compares with earnings of $159,508 or 47 cents a share in the 1938 period. Unfilled orders at June 30, $1,507,474, against $1,530,-014 at June 30, 1938, and $1,-070,338 at Dec. 31, 1938.

» IRVING AIR CHUTE CO., INC., for six months ending June 30, 1939, estimated net profit of $215,894, or $1.09 each on 197,100 shares of common stock. Compares with profit of $194,-803 for the 1938 period, or 99 cents a share.

» GLENN L. MARTIN CO., for quarter ending June 30, 1939, net profit of $285,127, equal to 26 cents a share, against profit of $744,037 or 79 cents each for like 1938 period, and $682,496 or 63 cents each for the March, 1939, quarter. For six months ending June 30, 1939, net profit of $967,624 or 88½ cents a share, compared with $1,372,600 or $1.51 for same period in 1938. Backlog as of June 30, 1939, $37,835,458, compared with $13,-903,006 on Dec. 31, 1938.

» North American Aviation, Inc., for the six months ending June 30, 1939, net profit of $2,-781,682 after tax provision of $767,000. Compares with profit of $590,175, after tax provision of $119,000, for the comparable 1938 period. Sales for the first six months of 1939 were $12,-965,836, compared with $3,345,-680 for the similar 1938 period. Unfilled orders at June 30, 1939, $19,005,328, against $14,952,854 at June 30, 1938. Unfilled orders at Aug. 10, 1939, about $32,-000,000.

» REARWIN AIRCRAFT & ENGINES, INC., filed registration statement with SEC covering 100,000 shares of $1 par common stock, to be offered at $3.25 a share. Proceeds will be used for development, design, equipment, and working capital.

» SEVERSKY AIRCRAFT CORPORATION received approval of the Curb Exchange for listing of 382,410 additional shares of common stock.

» SPERRY CORPORATION, a cash dividend of $1 per share, payable August 25, 1939 to Voting Trust Certificate holders of record August 18, 1939.

» TIMM AIRCRAFT CORPORATION filed registration statement with SEC covering 425,000 shares of $1 par common stock, to be offered at $1 per share. Company has contracted with Hughes Aircraft Co. for purchase of the design of the Hughes No. 1 plane, together with right, title and interest of the Hughes company to all engineering data formulated and used by it to design and manufacture the plane. Proceeds of sale of issue will be used to conclude the purchase contract with the Hughes firm for the purchase of machinery and equipment, and for working capital.

» UNITED AIRCRAFT CORPORATION, for six months ending June 30, 1939, net profit of $3,678,690, after tax provision, equal to $1.38 each on 2,649,437 shares. Compares with profit of $2,421,711 or 95 cents each on 2,531,607 shares in like 1938 period. For quarter ending June 30, 1939, net profit of $2,187,890 or 82 cents each on 2,649,437 shares, against $1,-490,799 or 56 cents on 2,649,437 shares in the March, 1939, quarter. For quarter ending June 30, 1938, profit of $1,349,-413 or 53 cents on 2,531,607 shares. Backlog as of June 30, 1939, $35,515,000; against $24,-074,000 last year.

» WACO AIRCRAFT CO., for nine months ending June 30, 1939, net loss of $8,355 against net loss of $28,305 for the 1938 period. Net sales in the period, $620,742, compared with $594,573 for the like 1938 period.

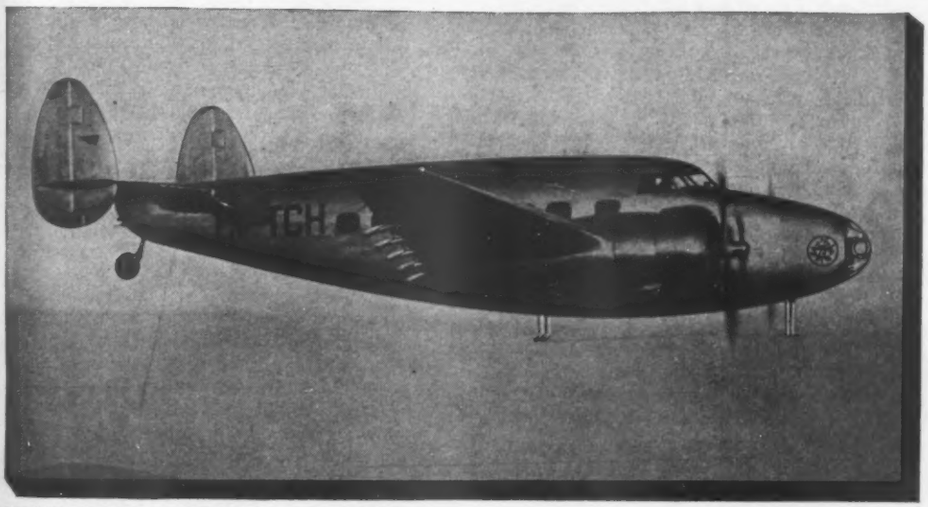
» WESTERN AIR EXPRESS CORPORATION, net income for June, 1939, $6,207; for June, 1938, net loss of $13,800.

BENDIX RADIO

BENDIX AIR RADIO NEWS

SEPTEMBER 1939 | Published by BENDIX RADIO CORPORATION, Baltimore, Md. | Cable Address BENRAD

TRANS-CANADA LOCKHEED 14's 100% BENDIX RADIO-EQUIPPED

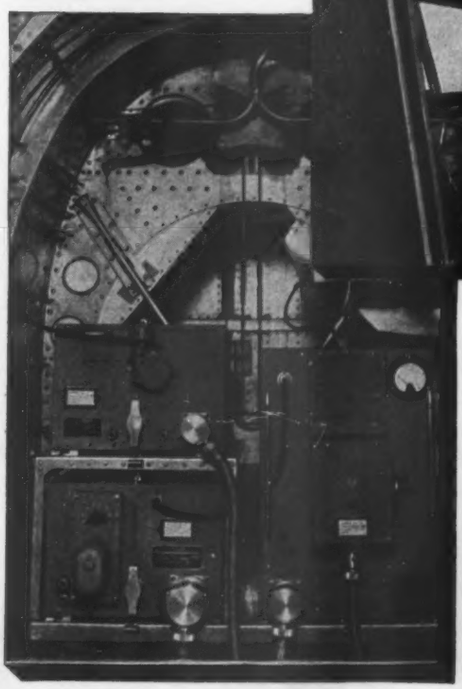


TRANS-CANADA LOCKHEED 14 IN FLIGHT The Bendix Radio Installation on these new airliners feature many novel developments of Bendix, T.C.A. and Lockheed Engineers. One outstanding example is the Plexiglass nose enclosing the loop antenna which eliminates wind drag without affecting the loop's electrical characteristics.

Five New Ships Have Bendix Transmitters, Communication, Radio Range and Auxiliary Receivers

T.C.A. Bendix-Equipped In Planes and Ground Stations

FLIGHT COCKPIT with all Radio Remote Controls conveniently located on a specially designed panel in full view and within easy reach of the pilot and co-pilot. The Azimuth Dial is located in the center of the compartment ceiling where it is equally visible to both pilots.



RADIO COMPARTMENT, showing the Bendix TA-2 Transmitter, with 100 watts output on eight pre-set crystal-controlled frequencies; the RA-2 Receiver, which permits reception on eight pre-tuned crystal-controlled channels between 2500 and 7000 Kcs; and the Bendix RA-4 Radio Range Receiver, tunable over the beacon band of 195 to 415 Kcs with a fixed channel of 278 Kc.

RG-2 GROUND STATION RECEIVER used by T. C. A. Flexible design provides for operation on four channels, with or without crystal control. Can be remotely operated over a single telephone line.

FLASH!

American Export Airlines reports unusual results with Bendix Radio on survey flights. Two-way communication with New York consistently maintained from flying boat while at anchor in European harbors.

POLISH L.O.T. AIRLINE also relies on Bendix Radio Equipment. The widespread use of Bendix Radio throughout the world is proof of its outstanding dependability, and also of Bendix's ability to serve Aviation everywhere.

TRANSPORT AVIATION

Air Lines Are Booming

Traffic floods promise black ink statements for 1939

You can put this in your book as gospel, "The Air Transport Industry, at least as it is represented by the four biggest domestic air line operators in the United States passed out of the era of consistent losses into a period of positive earnings in the year 1939." With six months' reports from the financial departments of American, United and TWA, you can prove this to yourself on the back of an envelope. Thusly:

During the first six months of 1938, these three air lines together lost a total of $1,782,986. Now American reports a profit for the six months ended June 30, 1939, of $403,000. United reports a net loss of only $202,962. TWA reports a loss of $355,867. Or, the net loss for this year by these three air lines lumped together is approximately $155,731. That's a gain from one year to the next of $1,627,255.

During the second half of last year, these three lines together earned a net profit of $215,764, from the characteristically bigger traffic loads carried from July through December. Therefore, even if business during the second half of 1939 is no better than during the second half of 1938, these three companies, together, will earn a small profit. Since passenger business promises to be actually at least 50 per cent better this year than last, it looks very much as though these three companies will individually and collectively show a splendid twelve month's statement. Add to this the fact that Eastern, which last year made a profit of $354,249, is this year known to be doing much better (no financial report is expected from Eastern until sometime in September) and you arrive at the certainty set forth in our first paragraph. Herewith some details of the individual statements:

American Airlines for the six months ended June 30, 1939 made a profit of $496,097.62 before deduction of federal income taxes estimated at $93,000, as against a loss of $151,234.22 in the corresponding period of 1938. American's twelve month net for 1938 was a profit of $213,262.

During the first six months American Airlines transported 213,594 revenue passengers as compared with 141,998 in the first six months of 1938. This was a gain of 50.4 per cent. Revenue passenger miles flown totaled 83,834,400 as compared with 58,786,003 in the corresponding period of 1938, a gain of 42.6 per cent. The company flew 8,311,751 revenue miles as against 7,062,243 in the first six months of 1938.

Passenger revenue of $4,338,675.39 during the first six months of 1939 compared with $3,115,492.65 passenger revenue in the first six months of 1938, a gain of 39.3 per cent. Mail revenue totaled $1,760,667.42 as compared with $1,616,104.54. Express revenue totaled $189,339.76 as compared with $137,059.76. Other revenue was $110,337.15 as compared with $94,226.03. Total operating revenue was $6,399,019.72, an increase of 28.9 per cent over 1938 when it was $4,962,882.98 in the first six months.

Expenses for the first six months of 1939 were $5,241,415.04 as against $4,253,569.39 for the corresponding period in 1938. Obsolescence and depreciation took $580,080.37 as against $751,661.76. Interest took $81,426.69 as against $108,886.05.

Transcontinental and Western Air finished the first half of 1939 with a net loss of $355,867, compared to a net loss of $671,051 for the same period in 1938. The net loss for the first quarter was reduced by a net profit of $8,974, in the second period, compared with a loss of $192,928 for the second quarter of last year. The comparison with the 1938 figures, according to the statement, includes an adjustment of air mail compensation which was granted the airline last December.

United Air Lines earned a net income of $216,123.11, after all charges, for the second quarter of 1939, equivalent to 14.4¢ per share of stock outstanding compared with a net loss of $243,030.84 for the same quarter in 1938, it was announced yesterday by President W. A. Patterson. Operations during the first half of 1939 resulted in a net loss of $202,962.05, contrasted with a loss of $910,701.41 in the first half of last year. During the three months ending June 30th the company flew 37,896,785 revenue passenger miles, a 30 per cent increase over the corresponding quarter of 1938. The company flew 1,341,154,398 mail pound miles, an 8 per cent increase over 1938, and 435,639,076 pound miles, a gain of 30 per cent over the second quarter of 1938.

Traffic Heads In Lima

"Air travel to Latin America and the means for the stimulation thereof" was the working topic of a traffic conference held at Lima, Peru late in July.

Attending the meeting, which was the first of its type ever held on that continent, were Harold Crary, Chicago, vice-president of United Air Lines; Charles Rheinstrom, Los Angeles, vice-president of American Airlines; Pan American Airways' General Traffic Manager V. E. Chenea, of New York, and Division Traffic Man-

WHAT THE WELL DRESSED HOSTESS WILL WEAR: Celebrating the new fashions are, (left to right) Valva Barrett, Northwest Airlines, Emma Reid, United, Gladys Entrekin, TWA, Lucia Greene, American and Alicia Romero, Braniff.

agers, Herbert C. Dobbs, Jr., of Miami, and R. Becerro Soto of Mexico City; John Vianna, Rio de Janeiro, traffic manager of Panair do Brasil and Harold Roig, New York, president of Pan American Grace Airways, who presided at the sessions. Said Pan American Grace's General Sales Manager John E. Muhlfeld:

"The conference was the first step in coordinating traffic on American airlines and increasing trade and tourist travel to Latin America. From it also came plans to speed mail, passenger and express service between the two continents."

U. A. L. Okays Injectors

United Air Lines has ordered 28 Twin-Row Wasp engines from Pratt and Whitney Aircraft Company at a total cost of approximately $350,000. To be used as replacements of engines already in service, these 28 will incorporate the new injection carburetor system, which has been tested on United Air Lines flying laboratory and is already installed on ten standard Mainliners.

TRAFFIC

» American Airlines reports a total of 19,301,587 passenger miles for the month of July, an increase of 66.7 per cent over July 1938. The number of passengers flown was 51,546, an increase of 72.5 per cent over the same month a year ago.

» Braniff Airways logged a total of 1,771,158 passenger miles during July. This represents an increase of 47 per cent over the month of July 1938.

AIR TRANSPORT INDICATOR

Aug. 1, 1939

164.4

Which is the ratio of passenger-miles reported by the Air Transport Association for all domestic lines for July, 1939, to the figure for July, 1938.

Trends for the year continued excellent. For the first seven months, traffic stood at 346,027,144 passenger-miles — up 38.2 per cent.

» Chicago and Southern Air Lines reports 4,745,481 revenue passenger miles during the first seven months of 1939, an increase of 29.5 per cent over the same period of 1938. July 1939 logged 769,754 revenue passenger miles, an increase of 21.6 per cent over the same month a year ago.

» Eastern Air Lines reports a total of 7,554,443 revenue passenger miles for the month of July, 1939. This figure represents an increase of 54 per cent over the same month a year ago.

STYLES FLY: Martha Stout Gledhill, newly appointed fashion editor of Good Housekeeping, steps aboard the Yankee Clipper for a quick trip to Paris.

» Northwest Airlines had an increase of 91.5 per cent in the number of passengers carried during July 1939, over the same month a year ago.

» Pan American Airways reports that 24,509,677 passenger-miles were flown for the second quarter of 1939, an increase of 18 per cent over the same period for 1938. The number of passengers carried was 57,237, an increase of 13.9 per cent over 1938.

» United Air Lines logged an unofficial total of 16,600,000 passenger miles for July 1939 exceeding all previous records for the second consecutive month. This figure represents an increase of 53 per cent over July 1938.

THE CONTROL TOWER

by DAN SAYRE

Hail and Farewell!

The Superintendent (Janitorial sense) of this column is about to leave these parts for the even hotter climate of Washington, D. C. He hereby extends thanks for your patience and an invitation to all of his thousands of constant readers to drop in at the Civil Aeronautics Authority where he will be pleased to serve them up whatever they require in the way of statistics or information.

The payoff is just ahead for air transport, at long, long last. Many of the lines are earning something and if mass psychology repeats itself, a popular rush for air travel is about due. Who'll get the money? After taxes and reasonable dividends, industries under federal control are never allowed big profits. Operators will have to spend it intelligently under the CAA eye, or take rate cuts. Better and safer equipment will head the list, then maybe general promotion instead of so much inter-snatch advertising. And air personnel, from the ceiling down, hope to get better paid. "The future of aviation" is swell but you can't eat it.

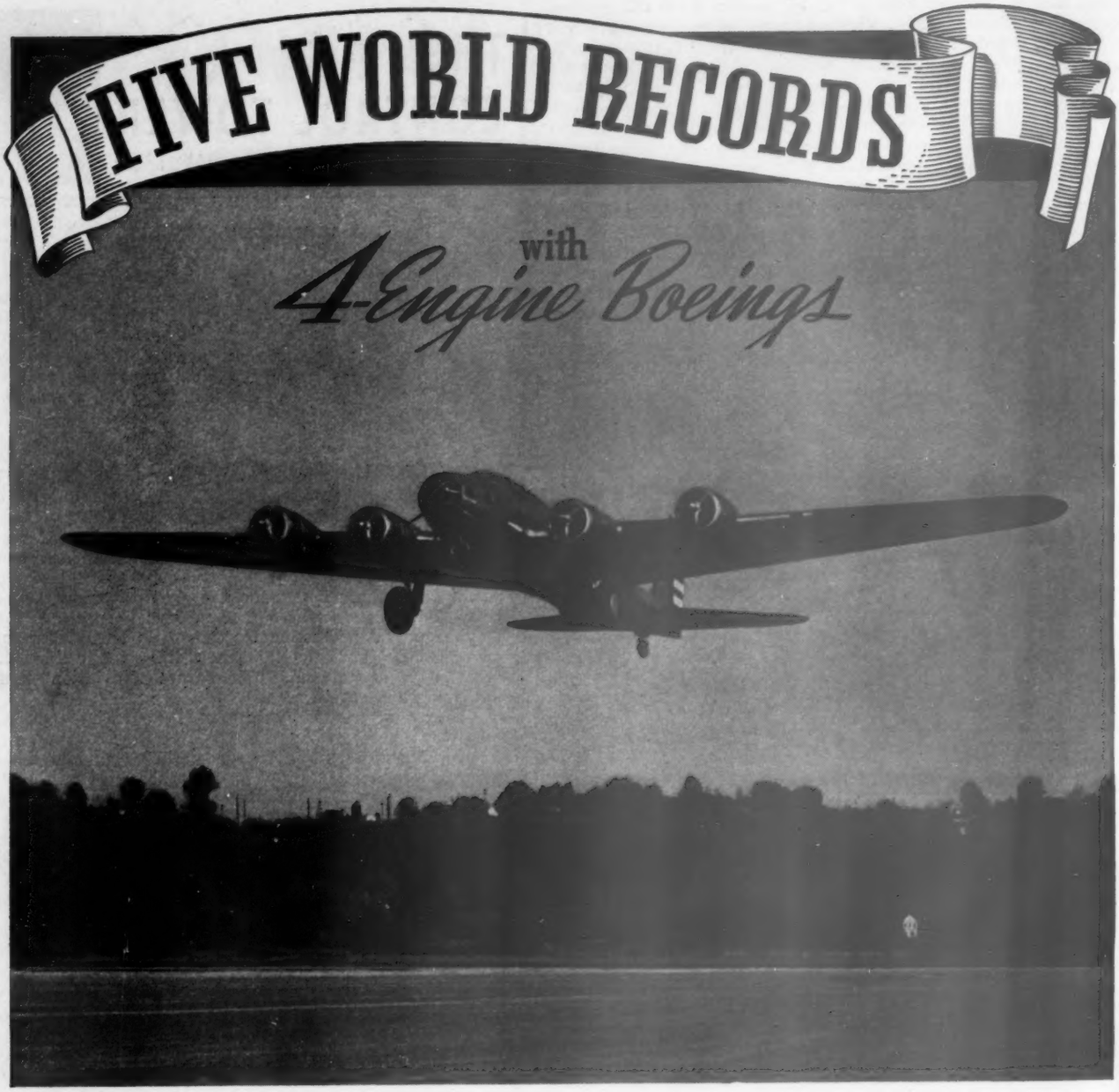
Asleep at the stick is the serious charge laid in civil aviation's lap by a Capital fly-fan who called on the chairman of a powerful committee in Congress. This committee can make or break aviation, whichever it will. Its chairman said to our friend, "You are the first representative of the industry who has been to see me. Where are all the others? What are they doing?" You Washington experts better think fast before your boss reads this.

Anytime you think your own particular air line system is running through a streak of tough luck, pause and consider the present plight of our British cousins on Imperial Airways. First their government decides to melt it into a state controlled company to be known as British Overseas Airways. In this country at least that makes them the BO boys from this time forth. Then Sir J. C. W. Reith, their chairman, comes on a friendly visit to the United States and gets promptly slapped with a writ by the widow of one of the victims of the Cavalier disaster, who is suing for very heavy dough. Then the decision is made in England to suspend all passenger bookings on Imperials lines to Africa and Asia, at least until the Christmas flood of mail loads from the Empire Airmail scheme is over. Reasons given all boiled down to lack of equipment. There are only 21 Empire boats left now from an original 30. Just to add a touch of sauce onto all that grief, one of the remaining 21 cracked up in Basra the day after the decision was announced.

It seems the DC-4 was making its first landing at the Newark Airport. Its flight plan was a mere shuttle over from Floyd Bennett. The weather was clear. But everyone concerned, especially the control-tower boys were being extraordinarily meticulous about the whole procedure. A TWA plane from Pittsburgh was carefully held out of the field, and I mean way out. Majestically the DC-4 swung in and rolled to a stop. "Come in now," said the control tower to the TWA flight, "the overcast has landed."

FIVE WORLD RECORDS

with 4-Engine Boeings



THE REMARKABLE SERIES of world record flights made recently by the United States Army Air Corps in connection with its thirtieth anniversary program reflects great credit to the efficiency of the nation's Army air force and its equipment.

The BOEING COMPANY takes pride in the fact that five of these records were made in the Army's 4-engine BOEING Flying Fortress and Super Flying Fortress types.

Following are the categories in which these planes set new international performance marks.

B-17A Flying Fortress — Greatest speed for 1000 kilometers (621.4 mi.) with a pay load of 5000 kilograms (11,023 lbs.); and greatest altitude with the same pay load.

B-17B Flying Fortress — Fastest time over the Los Angeles-New York course for airplanes carrying passengers or crew.

B-15 Super Fortress — Greatest pay load carried to an altitude of 2000 meters (6,561.666 ft.); and greatest speed with a pay load of 2000 kilograms (4409.244 lbs.) for a closed course distance of 5000 kilometers (3107 mi.).

These record-breaking flights, made with standard service equipment, are indeed a striking demonstration of the capabilities of America's aerial defense.

BOEING

BOEING HAS ALWAYS BUILT TOMORROW'S AIRPLANES TODAY!

AVIATION OPERATORS CORNER

C.A.A. Training to Continue

Hinkley Announces Details of First Year's Expanded Program

Immediately following Congressional provision of $4,000,000 for the first year of the C.A.A. Civilian Training Program came announcement of the details by Chairman Hinckley. According to the announcement operators will be paid from $270 to $290 per student for the 35-50 hour controlled flight courses and participating institutions will receive from the government $20 per student to help defray ground school expenses. Students may be required to pay laboratory fees not to exceed $40 to the colleges, this sum is to cover C.A.A. medical examinations, insurance and administrative fees.

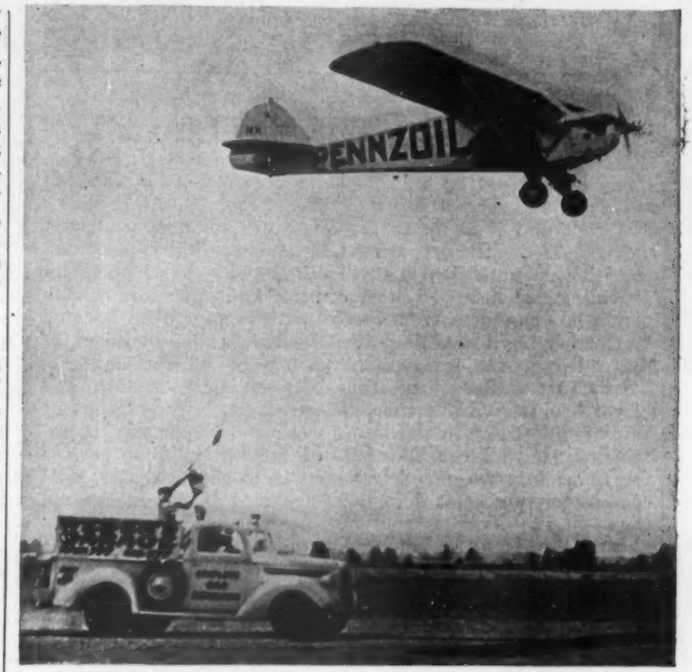
Operators must be in a position to furnish approved flying equipment and landing facilities, and provide a re-rated instructor for each ten students. Airports must be within ten miles or thirty minutes legal driving time (maximum, 45 m.p.h.) of participating institutions. Public liability coverage of $50/100,000 and property damage insurance of $5,000, as well as compensation insurance on instructors must be carried by the operators. Flight training must start between October 15th and November 1st. For the first 12 hours the student is to be given three-30 minute lessons per week and for the remainder of the course, two one hour instruction periods per week. He must never receive more than one flight period per day.

Applications, obtainable from C.A.A., are in three parts. Part 1 must be filled out by the institution, part 2 by the manager of the recommended airport, and part 3 by the recommended operator. Filing of the entire application is the responsibility of the institution.

Putting a factor of 1½ on the old light plane endurance record of 218 hours, the Moody brothers, Humphrey and Hunter, tacked up a new mark of 343 hours and 46 minutes. This time is not only significant because of its length, but also because this is the first duration flight in which the pilots have not left the ship.

With the exception of a few additional instruments the Moodys flew a standard Taylorcraft plane powered with a 55 hp. Lycoming motor. The gasoline supply was replenished by gallon cans hoisted by a rope from a speeding truck, and during the flight 739 such refueling contacts were made. Motor oil was changed every twelve hours, with no oil being added in the meantime.

The flight came to an end when an approaching thunderstorm made flying hazardous, almost exactly two weeks after their take-off at 3 p.m. July 23. During this time they flew approximately 27,500 miles all within a stone's throw of Springfield, Ill.



TAKING IT ON BOARD. This is how the Moody brothers refuelled when the time came during their record breaking endurance flight.

18,770 ft. is the record set recently in a stock model 1939 Fairchild "24" by Miss Grace Huntington of Los Angeles, California. This record is for landplanes of the first category, meaning those powered with motors having cylinder displacement between 397 and 549 cubic inches. The motor used in this plane was a Warner 145 hp. and, other than oxygen equipment for the pilot, no alterations were made nor special equipment added. Miss Huntington completed the flight, which was done after three years' experience and 200 hours' flying time.

A new State Aeronautical Development Commission has recently been appointed for the state of Connecticut with Harvey L. Williams, of Greenwich, as chairman. Williams has been prominent in Connecticut aviation and is an industrial engineer with offices in New York. Other members of the new commission are: Donald H. Brown, Igor Sikorsky, Lyman B. Brainerd, Franklin Farrell, R. D. W. Vroom, Walter B. Lasher, Norman V. Clements and Frederick H. Allen. The commission will advise with and assist the existing State Aeronautics commission headed by Charles T. Morris, and it will study the problem of airports and airways for the state.

Seeking to shatter the 14-day endurance record recently set by the flying Moody brothers of Springfield, Ill., Dale Deckert and Troy Colbach took off from Martin Airport, Santa Ana, Calif., in a Lycoming powered Taylorcraft similar to the new record holder whose time they hope to eclipse. A full-length bed is included as equipment.

NEAR THE HEART OF HARTFORD: This new seaplane dock adjacent to Brainard Field has just been opened for traffic.

TAGGING THE BASES

with LES NEVILLE

$4,000,000 for Fixed Base Operators

Congress has put up $4,000,000 to create 10,000 new private pilots during the first year of the CAA Training Program and it is up to the operators to make the next move. As in the experimental phase of the program, established educational institutions will participate in providing the ground school courses and operators within prescribed distances from these institutions will be selected to furnish flight training at $270–290 for 35–50 hours of controlled course instruction (see page 71 for details). Flight instruction must start between October 15th and November 1st. Since there is a scarcity of the types of ships required for this training work and since their manufacturers have large back-logs of orders, the time is ripe for immediate action. First step is to contact your local colleges or educational institutions, and if necessary, sell them on the idea of applying for one of these courses. Second step is to convince them that you are the man for the flight training part of the job. After these two moves have been made, don't wait but place your orders for equipment so you don't get left out in the inevitable scramble this fall.

Your airplanes may be gone with the wind if you don't get busy and find a place to put them. We saw one example recently of what a small scale twister did to a batch of ships at Central Jersey Airport. There will probably be more this fall because light planes have been built so fast that there is not nearly enough hangar space available for them. And they are just the type that are most susceptible to wind storm damage. But it isn't this type of damage alone that is worrying the insurance companies and others farsighted enough to look a couple of months ahead. A recent letter from Jerry Lederer, of Aero Insurance Underwriters, predicts losses this fall from theft, pilferage, and hail storms as well as wind storms. Jerry has backed up his statements with a report from one of his field representatives who points out that proper mooring will assist in reducing losses from wind storm, but is no protection against hail. He also points out that cabin door locks are much needed on airplanes to discourage pilferage of equipment within the airplane. He further reports that metal hangars for 10 planes can be built for $4-5,000 and 20-plane shelters for from $6-7,000. Such structures would be self-liquidating projects in about four years at a rental charge of $15 per month per plane, and they look like a good investment for municipalities and others. With the cooperation of Aero Insurance Underwriters, AVIATION will soon present some practical ideas on the mooring problem. Watch for them in an early issue. In the meantime, think over this hangar construction idea as there may be gold in it for operators and security for plane owners.

We wouldn't believe it if we hadn't been there ourselves but our old friend Al Bennett certainly had a turnout at his dealers meeting early in August. Over fifty dealers, engine and accessory manufacturers braved bad weather over the mountains to turn up for the show, and there was ample opportunity to fly Cubs of all types. This meeting is just another example of the advanced merchandising methods that are slowly creeping into aviation. But they are not coming in fast enough. Every distributor of private airplanes in the country should set up similar meetings for the dealers in his territory.

Taking another forward step in airplane merchandising, Cub Distributor Al Bennett called together his dealers on Aug. 8 for an all day meeting at Hightstown, N. J. The First Cub Dealers' Convention was well attended by representatives of engine and accessory manufacturing companies, insurance, financial men, and others, in addition to the dealers themselves. Some 56 delegates were present.

The morning session was devoted to demonstration flights of various types of Cubs with various engine installations. Shortly after noon the delegates assembled at the Old Hights Inn where luncheon and dinner were served. Speakers of the afternoon session, which was opened by W. H. Piper, included Gordon Curtiss (Aviation Funding); Richard Bole (Aero Insurance Underwriters); and William Schlegel (Switlik). Guest speaker at the dinner meeting, sponsored by the Lycoming Division, Aviation Manufacturing Corp., was Capt. Gil Rob Wilson, State Aviation Commissioner for New Jersey. Mr. Piper and Roy Barrette, of Parker & Co., also addressed the evening meeting. Other speakers included: D. H. Hollowell and James Fornasero (Continental); George Levis (Lycoming); C. H. Bennum (Franklin); M. A. Cooper and Roemer Weyant (Lenape). The convention wound up with ideas by Al Bennett on how to increase sales. Among the dealers who spoke were G. Braman, who has just opened Nassau Airport near Hicksville, L. I., and Winfield Treadwell of Camden, a newly appointed Cub dealer.

A lower fatality ratio in private flying accidents, and a definite trend towards an even lower figure, has been revealed by the Air Safety Board. This survey covers the latter part of 1938 and the early part of 1939. Reports still under study by the Board, however, indicate a distressing increase in private flying accident fatalities.

The accident fatality ratio has been reduced from 8.3 per cent for the year prior to the formation of the Air Safety Board, to the present 6.9 per cent, an improvement of 16.8 per cent. While the Board feels that private flying activities are still marred by an excessively high number of accidents of

HOW TO SELL CUBS was the subject selected by W. H. Piper for his talk at the First Cub Dealers' Convention.

GETTING READY FOR DEDICATION on Sept. 10 the new Hartford Airport is lined with cement mixers pouring in the new ramp. Also new is the administration building, the National Guard building and the return of American Airlines to make Brainard Field a regular stop.

both a major and minor nature, the decreased fall and winter fatality ratio is doubly encouraging in that it was linked with a general downward trend in the total number of accidents despite the increased flying activities.

Southwest Airport, Los Angeles, was finally abandoned August 1 as a result of a recent unfavorable court decision by which the city of Los Angeles succeeded in establishing the field as a public nuisance. The judgment established such restrictive operating limitations that it was physically impossible to continue operations. A neighboring field, Christianson Airport, was abandoned one week later. The Southwest Airport, formerly known as Dycer Airport, and before that Burdette Airport, was the oldest continually operated airport in Los Angeles county, the closest to downtown Los Angeles, and the most popular with private owners and pilots. Some twenty-four private hangars have been torn down and moved elsewhere, or junked, as a result of the closing. Elmer Riley, former operator, has moved to Gotch Airport, several miles farther south of the city, and Gage Flying Service, leading flying school operator on the field, has moved to Compton Airport, approximately fifteen miles from downtown Los Angeles.

Fair-aired pilots are concentrating from the east to attend the "Aerial Roundup" being held in connection with the New York State Fair at Syracuse. Robert E. Fowler, Advertising Director of Aircooled Motors, Inc., is Chairman of the Show, scheduled for August 26 to September 9, states that more than $500 in trophies and cash prizes will be awarded.

The Air Corps training base at Kelly Field will participate with the Thunderbird Aviation Club of Ponca City, Oklahoma, in the second annual Sportmans Air Show. The show is scheduled for Sunday September 17, at the Ponca City Municipal Airport, and is in celebration of the newly completed hard-surfaced runways and other improvements. Starting the festivities will be the termination of flight of the Oklahoma State Air Tour to Ponca City on September 16.

A class one waiver has been given to the air show of the Oil City Aero Club which will carry through its schedule of events on September 3 and 4 at the Splane Memorial Airport, Pennsylvania. Highlights of the show will be a smoke-writing trio headed by Captain Art Davis, and batwing parachute jumps made by Charles Zmuda.

AERONCA ACCOMPLISHMENTS: Left—Vice President Wootten presents Shyers Trophy to Buck Frame at Chattanooga meet. Right—Joe Wolfe who climbed a stock model to 17,800 ft.

The unique Annual Oregon Air Tour, sanctioned by the Oregon State Board of Aeronautics, and staged by 1939 Oregon Air Tours, Inc., under the direction of Dr. Paul W. Sharp, pres., was held from August 5 to 13 inclusive, visiting nine cities, attracting more than 250,000 spectators, and boasting approximately one hundred participating aircraft. This tour has been an annual Northwest event for a good many years and stirs up widespread public interest in private and commercial flying more than any other single event of the season. Commercial pilots are encouraged to hop passengers at each town visited, a cash prize of $500 is awarded to the pilot winning a tour-wide navigation contest (winner not announced at time of going to press), and all tour funds remaining at the end of the tour are divided among participating pilots. Towns visited this year included: Albany, Eugene, Portland, Salem, The Dalles, Roseburg, Prineville, Medford, and Klamath Falls, for a total of approximately one thousand route miles. Organizations co-sponsoring the tour at various stops include the American Legion, Veterans of Foreign Wars, Junior Chamber of Commerce, and the Federation of Eagles.

REPORT CARD

Of Air School

Squawks from the hens of San Fernando valley mingled with the roar of eighteen Lycoming powered Army PT training planes late in August as Major C. C. Moseley's Grand Central Flying School swung into full operation on the Army cadet flight training program. Capt. Edwin M. Day, commander of the Grand Central Flying School detachment, has taken steps to quiet the hens and is proceeding with training of some 70 cadets and more than 100 mechanic students. Cadets are housed in the former Aviation Country Club building, mechanic students in new barracks recently completed, and flying operations are largely conducted from a new field in the west end of San Fernando Valley and in the heart of what has been called the world's greatest poultry center. Moseley also has a record enrollment of civilian technical, mechanical and engineering students at work in his Curtiss-Wright Technical Institute, located on Grand Central Air Terminal.

New York City's Y.W.C.A. leads again in answering young people's wants and needs. On Wednesday, October 4th, the Central branch of the "Y" will begin a six weeks course in Aviation. The following subjects will be covered: How Airplanes Fly, Airplane Types, Power Plants, Propellers, Airports and Airways, Instruments and Safety Devices. Instructor and lecturer is Edward B. Heyl. "Phonography, stenography to you, was added to the "Y" curriculum in the 1870's when some people dared to believe that it was not "too difficult for the feminine mind." And so today, Aviation takes its place among seventy other classes of the "Y's" curriculum.

Something new has been started at Hofstra College, Hempstead, L. I., in a course to train men who wish to qualify as "Flying Cadets" for the Air Corps. Two years of college training, or the equivalent thereof, is necessary to enter the three year night course, which work will be accredited towards the degree of Bachelor of Science in Commerce. The object of the course, according to President T. P. Calkins, is to train young men who desire to enter military aviation or commercial aviation, either as a pilot, or as an administrator or executive in the industry.

CAA approval has been given to the Luscombe School of Aeronautics which has recently added a completely modern equipped engine shop. The school is headed by Mr. Louis H. Lawton and requires one year for completion to qualify for A. and E. license examinations. Plans are also being made for the addition of a Sheet Metal Shop and expansion of the present facilities before the next class enters the school on October 1.

Co-operation from Rochester has just been obtained by the local Pilot's Association and the two together have opened the Radio School of Aviation at the Municipal Airport, The course taught is free to the students, and covers the operation of a modern airport, theory of flight, instruments and the construction of the airplane. Through this school it is the aim of the association to stimulate interest in flying and aviation in the city of Rochester and its vicinity.

Increased enrollment expected in the Rising Sun Aircraft School has necessitated an increase in the size of the teaching facilities. A new floor adding 15,000 sq. ft. to the school building will be opened for the Fall term. Incorporated in the new addition is an enlarged propellor department with a new protractor table to check and synchronize propellor blades and several new three bladed controllable pitch propellors.

1939 Air Races

(*Continued from page 42*)

ton-Standard constant speed propeller and has built a wing of entirely new design. The new wing is of elliptical plan form, and is relatively stubby, having a span of but 18 ft. Both Rider and Folkerts were disappointed with their new planes last year and its a cinch that both of them will have "shot-the-works" in an effort to regain their lost prestige through 1939 performance. We expect the *8-Ball,* probably flown by veteran Joe Jacobson, to give any of them a battle in both the Greve and Thompson.

Harry Crosby has made almost no changes in his racer this year, but has concentrated on getting it in shape to run without any of the difficulties which have beset him in the past. Crosby's present plane is said to be somewhat faster than the original racer in which he crashed two years ago. At that time the air speed indicator came through the crash and stuck tight at 364 mph, which is at least a good point from which to start guessing about the speed possibilities of Crosby's present job if and when it is running right. Crosby has Rudy Kling's old Fahlin propeller and may bite quite a hole in some of the Cleveland air along about Labor Day.

Only brand new race job at Cleveland, so far as we know, will be the *Floyd Special*— if it gets there. In mid-August the Floyd ship had not yet been test flown. However, the design is almost identical with that of the Chambers racer, which looked promising last year until lost in a crash, except that the Floyd plane carries a six-cylinder Menasco B6S engine, instead of the four as did Chambers'. The Floyd racer is also quite similar to the Folkerts in general layout, being a high mid-wing cantilever monoplane. The ship is perfectly clean, as the landing gear retracts straight up into a fuselage well, and should be awfully fast. Wing span is astonishingly low—13 ft. 10 in., and the wing uses a very thin section, the NACA 2406. Wing loading runs up to around 30 lb. per sq. ft. with max. fuel load. And Bob Bean, the pilot, is a nice young commercial pilot who has a total of around 700 hours, none of it on race planes. Therefore, if Bean is able to handle this chunk of barely-winged dynamite he may cut quite a swath among the trophies. The Professional Race Pilots Association is a bit skittish about Bean's participation in the 1939 meet and will keep a very wary eye on his flight testing. Under the circumstances Bean and Floyd, who built the plane to-gether and hold it in joint ownership, will certainly deserve any prize money they win. Being young at the game, these fellows still have some hope for the future of racing. In developing their present plane they have received generous help from Mr. J. A. Tillotson, Assistant Secty., and Wm. Johnson, mgr. of the instrument shop, at Pacific Airmotive Corp. Through these men they obtained the Menasco B6S racing engine originally used in the Rider racer now owned by Schoenfeldt.

The other planes entered for the Greve Trophy Race include the *Miss Los Angeles, Delgado Flash,* and Howard *Mike.* All are well known to our readers. This will be about the eighth season of competition for *Mike* and the sixth for *Miss Los Angeles.*

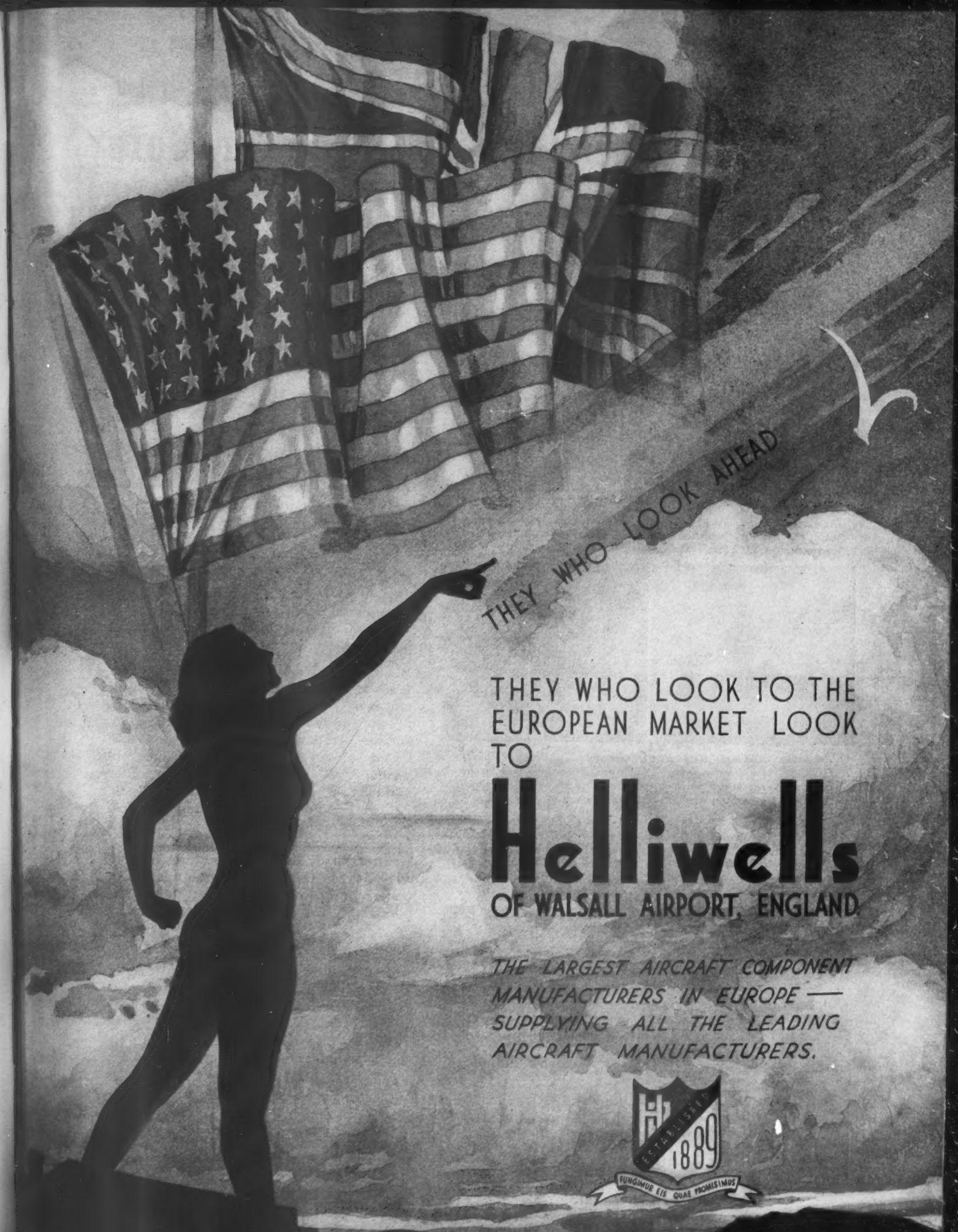
Which brings us to Roscoe Turner and the classic Thompson Trophy. Roscoe is said to have picked up 25 mph. through improvements and adjustments on his engine. Theoretically, he should fly the Thompson at better than 300 mph,—and we think someone will do just that this year,—but not Roscoe. If Roscoe does, then someone else will be ahead at the finish. There is a bare possibility that the Hughes racer will be entered in the Thompson instead of the Bendix. If so we think it will finish in front of Turner, but not in first position. We are going right out on a limb and picking this as another in-line engine year.

We have picked Art Chester as the favorite to win the Thompson. This was arrived at in a fairly simple manner. We figure one of the four fastest 550's will cop the Thompson this year, but in view of the working over they all get in the Greve the day before, it is anybody's guess which one of the four will be able to go the route top speed on Monday. Knowing how diligently Art Chester has labored to make his engine cool and smooth, we figure he is the boy to rise up in all his wrath and turn on the heat on Labor Day. Furthermore, we wrote the names of LeVier, Chester, Folkerts, and Rider 8-Ball on four slips of paper put them in a hat and then pulled one out. It said "Chester" on it, which is how we dope our Thompson favorite.

Getting back to more solid ground, we want to remind our readers of Rudy Kling's 1937 race. Many cries of "fluke" were raised at the time, and some thought Rudy's victory was purely accidental. It is not generally known that Kling's Folkerts was the fastest plane on the course in 1937. Racing against Turner's big job, and Wittman's *Bonzo,* Rudy was apparently left far back in the ruck while Wittman ran away from the pack. When Wittmann and Turner ran into trouble Rudy snuck in a winner. Actually Wittman was much faster than Turner on that occasion. Yet Rudy's best lap, 279 mph, was better than anything turned in by Wittman. Rudy was still pretty much of an amateur at the time, and he was flying a new plane and engine. He got a very bad start, so was way back in the early stages of the race, but he flew almost every lap faster than the lap before. Three of his lap speeds were faster than Turner's best lap and his plane and engine were going strong at the finish.

It seems fairly obvious that Kling in 1937 had some of the stuff on the ball which DeTroyat showed us at Los Angeles in 1936. And it isn't much of a boost from 279 to 300 mph in two years time. So if Rudy could do 279 with a Folkerts in 1937 we suspect that Del Bush will do at least that well with his Folkerts in 1939; and that LeVier, Jacobson, and Chester will all do as well, or better. The Marcoux-Bromberg racer has never done much better than 265 mph on a closed course, so we find Roscoe carrying the torch against odds of four to one, which is enough to encourage us to start cheering for the 550 cu. in. inlines thirty days in advance of the races.

One unconsidered factor this year, however, is Wittman's *Bonzo.* Wittman ran away from everyone in 1937 as long as his engine ran. He may be back with a new shot of "go-grease" in this year's Thompson, to spring an upset on our favored 550s. In any event we have doped Wittman in third position, ahead of all the 550s but one. And we think the reliable Marcoux-Bromberg will come steaming along in about fifth spot at the creditable speed of 275 mph. Strung along behind will come LeVier, Jacobson, Crosby and Bean in the 550 jobs, ahead of Lt. Joe Mackey in Roscoe's Wedell-Williams, which doesn't look to have speed enough to get up near the front this year. We may be badly jumbled on our respective guesses on place among the 550s, but we think they'll be up near the front in some order, barring crashes or engine failures in the Greve race which would keep one or more of them from competition in the Thompson.


THEY WHO LOOK AHEAD
THEY WHO LOOK TO THE EUROPEAN MARKET LOOK TO
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OF WALSALL AIRPORT, ENGLAND.
THE LARGEST AIRCRAFT COMPONENT MANUFACTURERS IN EUROPE — SUPPLYING ALL THE LEADING AIRCRAFT MANUFACTURERS.
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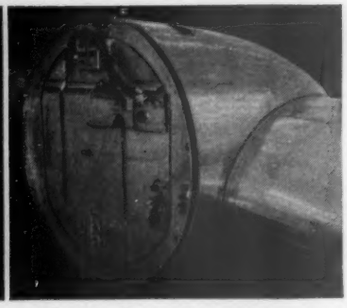
How STAINLESS STEEL helps make Aircraft Lighter, Stronger, Safer

This Vultee V-12 attack bomber uses stainless steel for exhaust manifolds and fire walls to resist heat and corrosion and for military applications where lightness, corrosion-resistance, and abrasion-resistance are essential.

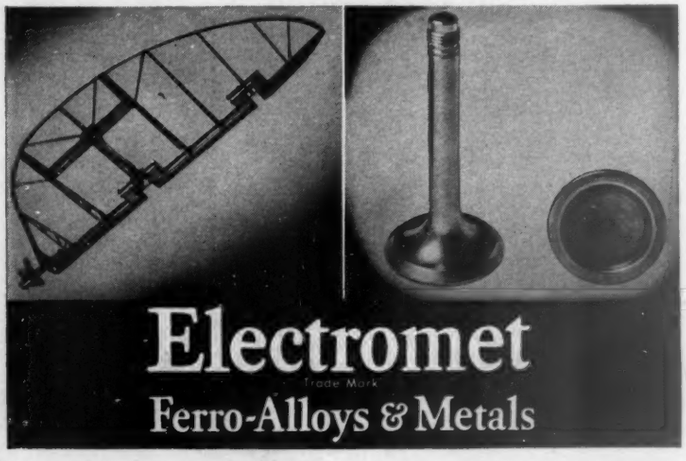
Above: Latest Piper "Cubs" use lightweight, corrosion-resistant stainless steel gasoline tanks.



Above: This 18-8 stainless steel fire wall for use on the Douglas DC-4 is fireproof and immune to corrosion.

Below: A light, strong elevator frame for a Seversky P-35 fabricated from stainless steel by high-speed spot-welding.

Below: Stainless steel sodium-cooled exhaust valves, faced with Haynes Stellite alloy, after operating 714,000 air miles.



DESIGNERS and manufacturers of all types of aircraft find stainless steel an ideal material for an increasing number of uses. A few typical applications are shown here. Stainless steel has four inherent advantages which make it a logical material for use in aircraft construction:

1. **Excellent Strength-Weight Ratio** — Compares favorably with other commonly used materials. *Result:* Strength with light weight . . . more pay load . . . longer cruising range.
2. **Ease of Fabrication** — by modern, high-speed welding processes. *Result:* Faster production . . . cheaper production. Smoother surfaces . . . less drag . . . higher speeds.
3. **Corrosion Resistance** — immune to atmospheric corrosion. *Result:* No painting . . . faster production . . . less maintenance.
4. **Strength at High Temperatures** — up to 1650 deg. F. *Result:* Resists hot, corrosive gases and abrasion . . . longer life . . . dependability. Fireproof . . . greater safety.

We do not make steel, but for over thirty years we have produced "Electromet" ferro-alloys used in making steel. The fund of data on stainless and other alloy steels thus accumulated and the assistance of our metallurgists are available without obligation. A request on your letterhead will bring the book, "Stainless Steel in Aircraft."

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

The word "Electromet" is a registered trade-mark of Electro Metallurgical Company.

Making Use of Ground Effect

(*Continued from page 33*)

that are very large, or when a wing is too close to the ground surface. However, we note that in some cases the formulas have been applied for ranges in angle of attack up to the stall, and for flights quite near to the ground surface. Of course it is seldom that a landing is made in a still atmosphere. Wind movements are usually present, and careful investigations have revealed the presence of wind speed gradients for vertical distances ranging from five to fifty feet above the ground surface.

The curves of Fig. 2, taken from flight tests made in 1934-5 on a Bristol Seaplane (biplane) demonstrate in a striking manner the extent to which the theoretical corrections can depart from actualities. The ground surface is now replaced by a water surface, but the Wieselsberger formulae apply equally well in both cases. The wings of this airplane possessed equal spans, of 75 ft. each, with chords of 10 ft. and wing gap of 10 ft. The lower wing was at a mean height of 9 ft. above the water surface during the test observations for interference effects. For the specified conditions of flight, the interference factor $=0.34$ if the mean height above the water surface is assumed to be 14 ft. Selecting an angle of attack of 7.5 deg. we note that for a glide clear of the ground (or water) effect region, the corresponding value of the lift coefficient is 0.68. Within the interference zone, the tests indicate that for the same C_L, the angle of attack becomes 5.5 deg.

From formula (2), it is found that the apparent aspect ratio, in the interference zone, is:

$$n' = \frac{4.2}{(1-0.34)} = 6.36$$

The geometric aspect ratio is computed from:

$$n = Kb^2/S = 1.12 \times (75)^2/1500 = 4.2$$

The effective angle of attack for $C_L = 0.68$ is now obtained by use of the well-known transformation relation:

$$\delta' = \delta + C_L/n\left[\frac{1}{n} - \frac{1}{n'}\right] \times 57.3$$

where "δ" and "n" apply for flight at altitudes well beyond the influence of the ground effect region. Therefore:

$$\delta' = 7.5 - \frac{0.68}{3.142}\left[\frac{1}{4.2} - \frac{1}{6.36}\right] \times 57.3$$

$$= 6.49 \text{ deg.}$$

But the curves of Fig. 4 show $\delta' = 5.5$, a difference of $(6.49—5.5) = 0.99$ deg. The correction is in the right direction but about 48 per cent too low. The broken-line curve has been laid off by use of the above formulae.

The curve of Fig. 3 shows how the interference factor "δ" varies with the height-span ratio (h/b). We note that interference is greatest for low values of this ratio, or when the wing is quite close to the ground, and rapidly decreases as the ratio grows. The curve is based on the Prandtl formula:

$$\delta = \frac{1}{1 + 10.6\, h/b}$$

The effect of different geometric aspect ratios on the manner in which the induced drag coefficient C_{Di} changes with changes of height-span ratio (h/b), are well brought out by the curves of Fig. 4. Apparently the lower the geometric aspect ratio the greater will be C_{Di} for a given C_L and (h/b), but the effect of aspect ratio soon becomes negligible for geometric aspect ratios greater than 10. The lowest curve has been inserted to emphasize the very decided drop in the magnitude of C_{Di} when C_L is reduced; in other words, the induced drag correction is only of importance at comparatively large angles of attack. The rate of change of C_{Di} with (h/b) is noticeably greater for the low aspect ratio craft, but in all cases will be most in evidence for changes in altitude which occur quite close to the ground surface.

Since C_{Di} is a function of C_L, it is interesting to bear in mind the effect of changes in (h/b) on the lift coefficient for different values of the geometric angle of attack. The curves of Fig. 5 are based on the experiments of Tonnies, but have been substantiated in a general way by the results of both laboratory and flight tests. For low values of the angle of attack, C_L appreciably increases the closer an airplane flies to the ground surface; but as the angle of attack is given higher values, the growth in C_L diminishes until at stall values there may arise a reversal and C_L starts to decrease. Aerodynamic theory so far fails to instruct us as to the functional relation between C_D and C_L at large angles of attack, but we may infer from known facts that it is possible for the decrease in the induced drag to be accelerated at high angles of attack when an airplane is quite close to the ground surface. It is quite possible that the profile drag of a wing is also subject to interference effects under such conditions.

We have so far studied the manner in which the induced drag coefficient C_{Di} is affected by the ground effect. It is now appropriate to note briefly the effect on the induced and total drag. The induced drag is given by the well-known formula:

$$D_i = 1/2\, C_{Di}\, \rho\, S\, V^2$$

where S is the wing area in square feet, and V is the flight speed in feet per second. Hence it is observed that the induced drag is determined by the flight speed and the induced drag coefficient, and they do not change at the same rate. As the angle of attack is increased, V will decrease while C_{Di} increases, usually at a slower rate than the change in the flight speed. We can then say that the change in the induced drag and hence the horsepower required to overcome the induced drag can be represented by curves similar to those of Fig. 4, but they will be somewhat flatter than the latter curves.

Some Practical Aspects of "Ground Effect."

As stated in the first part of this article, ground interference has been a well-known but not any too well-understood flight problem, and its relation to the ground performance of airplanes has remained very much in a state of flux. The successful development of the controllable-pitch propeller, together with the improvement and more extended use of supercharged engines and the growing use of wing flaps, have had a profound effect on the landing and take-off technique of airplanes. We should also add that the use of improved landing gear, both retractable and otherwise, has been an influencing factor in modifying the older and well-established methods of landing and take-off. A few remarks will be made concerning the landing of an airplane, as influenced by "ground effect."

The classical landing of an airplane, and it is still applicable to smaller-sized craft, consisted in a glide to within twenty feet or so of the ground at a speed somewhat in excess of the

(*Turn to page 78*)

Buyer's Log Book

(*Continued from page 49*)

Many manufacturers are making notable contributions to aviation trade literature. The following listed catalogs may be obtained by writing direct to the firms listed:

SELF-OILING HYDRAULIC HONING MACHINES—Bulletin No. 121-D and Bulletin No. 125-B. Two valuable bulletins for shop men faced with aircraft engine cylinder honing problems. Barnes Drill Co., 814-830 Chestnut Street, Rockford, Illinois.

BLACKMER ROTARY PUMPS—An illustrated folder describing a line of hand and power operated liquid handling pumps now being used widely in aviation for handling lubricants, dopes, lacquers, etc. Blackmer Pump Company, Grand Rapids, Mich.

BONNEY TOOLS—CATALOG NO. 39—A 91-pg. illustrated catalog, punched for loose leaf binder, illustrating the complete Bonney line of tools and tool cabinets. Bonney Forge & Tool Works, Allentown, Pa.

PNEUMATIC DIE CUSHIONS FOR POWER PRESSES—A folder of interest to aircraft shop men using the die stamping process. Dayton Rogers Mfg. Co., Minneapolis, Minnesota.

DICKEY-GRABLER CATALOG NO. 37—Dies, Tools, Metal Stampings, Marking Devices. A total of eighteen different products are listed and described in a wire bound 84-pg. catalog dealing exclusively with dies, stamps, and marking devices. The Dickey-Grabler Company, 10302 Madison Avenue, Cleveland, Ohio.

FRIEZ FLIGHT ANALYZER—An illustrated folder describing in detail the functioning of the Friez flight analyzing system, which records simultaneously all the essential flight and power plant functions. Julien P. Friez & Sons, Baltimore St. & Central Ave., Baltimore, Md.

JOHNSON LEDALOYL SELF LUBRICATING BEARING BRONZE—A 12-pg. bearing and bushing catalog. Johnson Bronze Company, New Castle, Pa.

KIDDE-LUX FIRE EXTINGUISHER, BULLETIN NO. AE-498—An eight-page bulletin describing the new pistol-grip handle, one-hand fire extinguisher with fingertip control. Walter Kidde & Co., Inc., 140 Cedar St., New York, N. Y.

HYDRAULIC PRESSES, BULLETIN 139—A four page bulletin dealing with high-production streamlined presses especially adapted to aircraft presswork. Lake Erie Engineering Corp., Buffalo, N. Y.

AERO LIGHTING, 1939—A loose-leaf catalog of the complete line of lighting equipment offered by Lights, Inc., with special stress on the portable by air equipment, and the battery operated emergency field lighting sets. Lights, Incorporated, 3508-14 Avalon Blvd., Los Angeles, Calif.

PRACTISE IN MACHINING ZINC ALLOY DIE CASTINGS—A 24-pg. book of considerable value to aviation shop people now that die casting is becoming a standard practise in aircraft production. The New Jersey Zinc Company, 160 Front Street, New York, N. Y.

NIAGARA FOLDERS AND BRAKES, Manually Operated, Bulletin 74-A—An 18-pg. catalog of folders and brakes such as are applicable to aircraft work. Niagara Power Squaring Shears, Bulletin 71-G. An 18-pg. booklet describing the latest Niagara shears, such as are in common use in aircraft plants. Niagara Machine & Tool Works, 637-697 Northland Avenue, Buffalo, N. Y.

stall speed, followed by a leveling-off into a flight path which is maintained parallel to the ground surface until the decrease in air speed attains the stall value and contact is made with the ground. In this form of landing the sinking speed at contact would usually be small or negligible. "Ground effect" comes into the picture during the interval between level-off and contact, when the airplane floats or skims along quite close to the landing surface.

The length of the "float" depends on the time required for the drag to absorb excess of kinetic energy possessed by the airplane over and above that which it possesses under stalled flight. In the older and slower speed airplanes, the drag under normal conditions of flight was relatively high, but when such craft came within the ground interference zone, their total drag was so materially decreased that the rate of kinetic energy absorption and the float distances were thereby lengthened. The only remedy was to see to it that the air speed at the end of the level-off was not very much in excess of the stall speed. Moreover, the fact that ground effect tends to produce a higher lift for a given angle of attack, means that the pilot cannot bring the angle of attack as quickly to its stall value, and this factor contributes to producing the "float."

THE modern types of airplanes with their inherently low drag will float farther for the same excess of speed at level off than the airplanes of former years. If the speed at the end of level-off is too high, and wing flaps are not available, the pilot can "hold off" and allow the drag to reduce gradually the speed to the stall value, or he can bring his craft into contact with the ground at an angle of attack somewhat lower than the stall angle, and consequently with an appreciable sinking speed. This necessitates the landing gear and tires being depended upon to absorb the shock without rebound, or too much discomfort. When an airplane is fitted with flaps which are deflected during the level-off, the greatly increased drag of these auxiliary surfaces quickly absorbs the excess kinetic energy with consequent reduction or elimination of the "float." Wing flaps, when deflected, do not change the stall angle but they do increase the lift coefficient at stall, and thereby decrease the stalling speed. For this reason lower contact speeds are made possible with the use of wing flaps.

George Pelham starts a career at the Boeing School of Aeronautics

1. From every side George hears good reports of the Boeing School of Aeronautics. He sees the School's advertisement in a magazine and sends the coupon—the important first step toward his career.

2. He arrives at the school and finds that his "campus" is the 890-acre Oakland, California, Airport. He sees why United Air Lines developed its modern school right in an active center of aviation.

3. George learns to build wings for all-metal training planes. He assembles propellers, engines, airplanes; tests oil, checks instruments—learns by sight and by touch every part of modern aeronautics.

4. From the very start, George learns actual instrument flying in Boeing School's Link trainer. Many flight pilots come to Boeing School to learn the instrument flying that George learns from scratch.

5. In Boeing School's Communications Shop George learns to build radio equipment and how to use radio-telephone equipment for contacts between ground stations and planes.

6. In the Meteorology Lab. George learns how to decode weather reports, plot signals, draw weather maps, analyze and forecast weather phenomena, using air mass analysis principles.

7. George learns the different types of parachutes—how to test their materials, pack them, etc. In the Flight House, he prepares for flight by donning his parachute and receiving last-minute instructions.

8. Here are George's instructors in the Flight Department. They are (left to right): George I. Myers, Superintendent of flight instruction, G. H. Willingham, LeRoy B. Gregg, and Carl T. Kuhl.

9. On graduation, chances are good that George will find a position waiting for him. He realizes now that filling out that coupon was really the first important step in his career.

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- ☐ Airline Mechanic
- ☐ Aircraft Sheet Metal
- ☐ Private (or) Solo Pilot
- ☐ Limited Commercial Pilot

Courses requiring 2 yrs. of college

- ☐ Air Transport Engineering

Courses for engineering graduates only

- ☐ Airline Technician
- ☐ Airline Meteorology

Courses requiring special training

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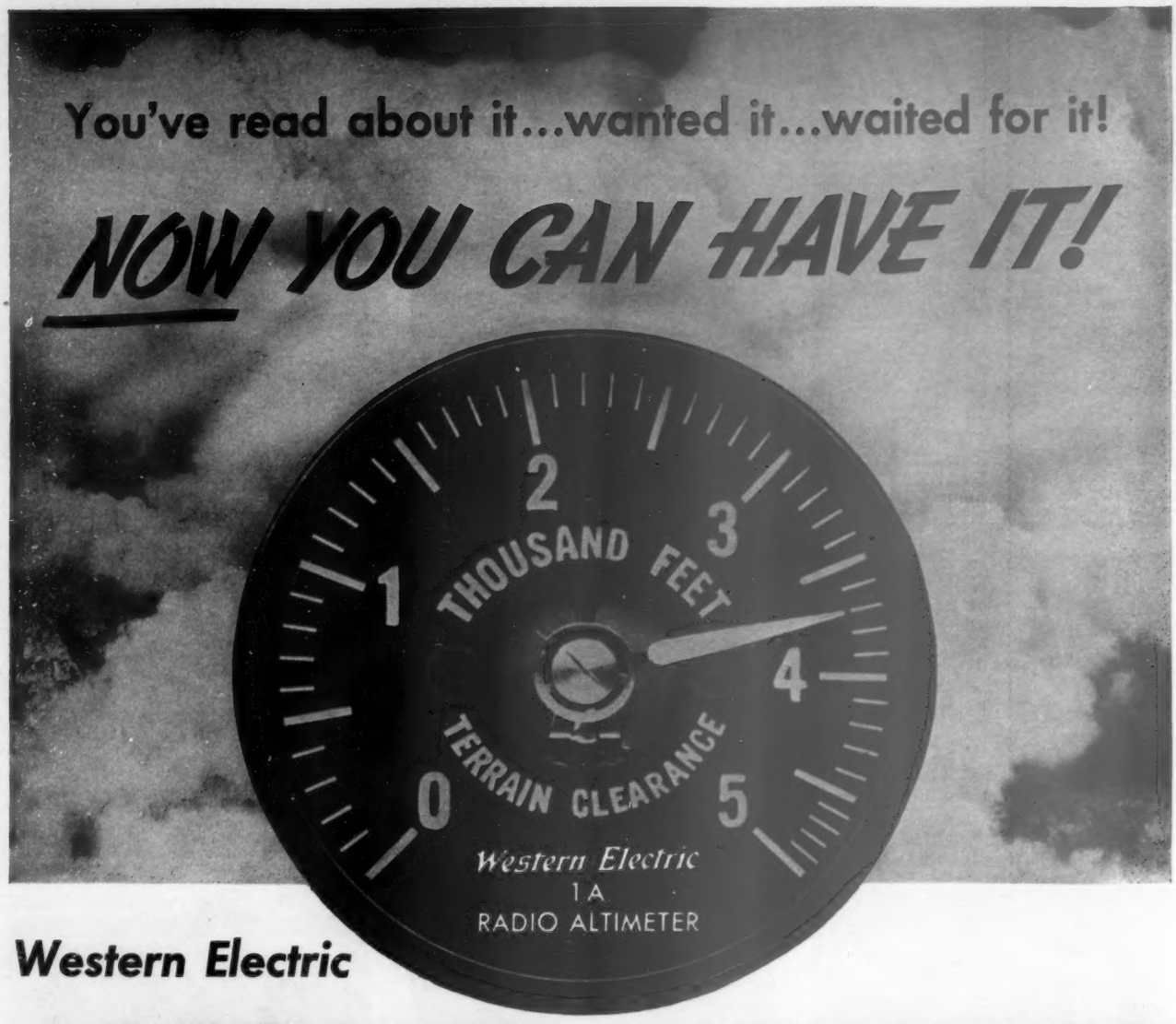

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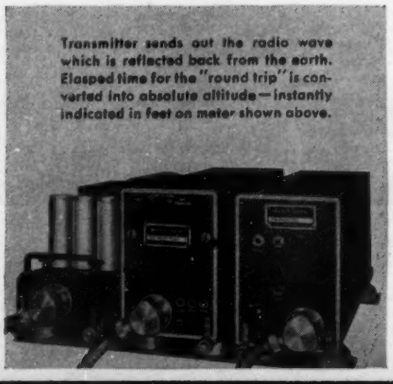
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The Birdmen's Perch

We were looking through some of our mail the other night when the thought struck us to take a census. Believe it or not, the last 200 letters included some 39 states, the District of Columbia, Hawaii, Ontario, British Columbia, Saskatchewan, Quebec, England, and Cuba with the long distance honors divided between J. A. O'Brien of New Delhi, India and Jack Millar of Melbourne, Australia, who live exactly 8,550 and 11,500 miles from here, respectively. *Gentlemen and scholars all!*

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips,"
Mgr. Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

A MARK OF PROGRESS

Headline flights—or at least most of 'em—are fine things. They serve indispensably to make flying a part of people's everyday conversation. And to hasten the day when it will become part of everybody's life.

But once in a while we mutter a little into our beard because some vital happening has not the news quality it should. For instance, we feel that the whole world should know that Pennsylvania-Central Airlines recently received the first permission from the CAA to operate their 550 H. P. Wasp engines 700 hours between major overhauls!

To our mind, that's news! It's a joint tribute to PCA's operation and maintenance procedure, to Pratt and Whitney who made the engines, and to Gulf whose aviation gasoline and patented Alchlor process Gulf Airline Oil—the commercial twin of Gulfpride—is used in every PCA plane.

It is this unique Alchlor process—used in addition to conventional methods—that digs down far deeper into the 100% Pure Pennsylvania . . . gouges out up to 20% more motor-gumming dirt and sludge. And which, in the first year, PCA used Gulf products, substantially cut their oil costs.

MENTAL GYMNASTICS

This month we have two head-scratchers, one easy, one a little harder.

No. 1—A mechanic reaches into a dark locker to get a pair of socks. There are in the locker 25 pairs of red, 25 pairs of white, and 25 pairs of blue socks all

jumbled up. How many socks does he have to pull out to make sure he has two that match?

No. 2—Take as a premise, first, that all trees have one or more leaves, and, second, that there are more trees in the world than there are leaves on any one tree. Does it follow that any two of all the trees must have the same number of leaves? Can you prove it one way or the other?

(Don't lie awake nights wondering if your answers are right. We'll be glad to mail you the official solutions. Just send your answers to T.W.T. to be checked.)

THIS MONTH'S WHOPPER

Dear Major:

A couple of years ago in Knox County, we were having a terrible drought. Hadn't seen any rain for a coon's age.

On one of those days that'd singe the hair off'n a dog's back, I decided to go to town for a quart of ice cream. On the way, I had to cross Pope Creek—a nice sized stream that's always had plenty of water.

As I was driving across the creek the darn bridge collapsed. And down I fell to the creek bottom.

Well, sir, I was slamming it through the gears trying to get out when the blame buggy ran out of gas. Luckily I had a pint of Gulf Aviation Gas under the seat that I used for a fly spray on picnics.

I poured the G.A.G. in the tank and stepped on the starter—you know, Major, that ark went down the creek like a bat out of the hot place, throwing water 70 miles in every direction.

It did such a good job of throwing water that nary a drop was left in the creek but the crops were saved from drought.

Robert Cowles

Gulf Oil Corporation and Gulf Refining Company . . . makers of

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QUOTES From The Hepburn Board's Report to the Naval Affairs Committee of Congress, March 20, 1939:

"The percentage of flying hours makes Jacksonville entirely acceptable from the point of view of weather."

"The advantages presented by Jacksonville are: Superior strategic location with entirely satisfactory operating conditions; superior transportation facilities and superior local labor and industrial resources."

"Moderate cost of development."

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